

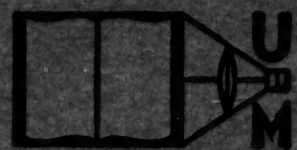
Vol. XVI

No. 1

# DISSERTATION ABSTRACTS

*ABSTRACTS OF DISSERTATIONS AND  
MONOGRAPHS IN MICROFORM*

UNIVERSITY MICROFILMS  
ANN ARBOR, MICHIGAN: 1956





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LITHOPRINTED IN THE UNITED STATES OF AMERICA BY  
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## INTRODUCTION

This year for the first time *Dissertation Abstracts* will carry, as the 13th issue of Volume XVI, an index to all doctoral dissertations published in the United States and Canada. This issue will be titled *Index to American Doctoral Dissertations*, and will be a continuation of *Doctoral Dissertations Accepted by American Universities*.<sup>1</sup> The joining of these two reference works makes it possible for librarians to have an integrated bibliographical research tool relating to doctoral dissertations under one cover.

*Dissertation Abstracts* will continue to provide abstracts of dissertations by recipients of doctoral degrees from graduate schools cooperating with University Microfilms in the publication of complete dissertation texts on microfilm, on Microcards, or as microprint. At the end of each abstract will be found an indication of the number of pages in the original typescript and the Library of Congress card number, for the convenience of scholars and research workers. In some instances *Dissertation Abstracts* will be found to be an adequate substitute for the published dissertations.

The *Index to American Doctoral Dissertations* will be a complete indexed listing of dissertations by students who were granted doctoral degrees during the previous academic year, and including those abstracted in *Dissertation Abstracts*, arranged by degree-granting institutions under appropriate subject headings. An alphabetical author index will be included.

The tabular material which has been an established part of its predecessor volume will be included in full, so arranged that statistical summaries can be maintained with no break in continuity.

It is hoped that those who use *Dissertation Abstracts* will continue to make suggestions for its improvement, as these are vital to its continued life and growth. Several suggestions for changes in the headings used for indexing purposes have been received, and a committee of the Association of Research Libraries is reviewing the indexing system at the present time as a result of these suggestions.

<sup>1</sup>Arnold H. Trotter and Marian Harman, (eds.), *Doctoral Dissertations Accepted by American Universities*. (New York: H. W. Wilson Co., 1933-1955.)



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## AGRICULTURE

### AGRICULTURE, GENERAL

#### A METHOD OF ESTIMATING MARGINAL VALUE PRODUCTIVITIES OF INPUT AND INVESTMENT CATEGORIES ON MULTIPLE ENTERPRISE FARMS

(Publication No. 14,268)

Christoph Beringer, Ph.D.  
Michigan State University, 1955

The purpose of the analysis was to modify presently used methods of productivity estimation so that they can be applied to the analysis of individual enterprises on multiple enterprise farms. Three multi-equational approaches were suggested as possible ways of solving the problem. These three approaches consisted of (1) a system of equations fitted by the method of simultaneous equations, (2) a system of equations, one equation for each major enterprise fitted independently to enterprise input-output data and (3) a system of equations, each equation fitted independently to data from specializing farms where the results of these estimates are applied on multiple enterprise farms.

Methods of grouping products into output categories and productive factors into input categories were considered. The conclusion was reached that generally products which are produced jointly can be grouped into one output category while products competing for resources should be analyzed separately.

Regarding the fitting of enterprise functions, it was concluded that fitting of one function to vertically integrated enterprises such as crops and hogs or crops and dairy is insufficient if it is desired to compare the productivity of various factors between crops and the livestock enterprises. Consequently, three separate functions were fitted, one to dairy, one to hog and one to crop-enterprise input-output data.

Regarding the grouping of inputs into input categories, it was concluded that an input classification which keeps intercorrelation among the independent variables and the errors of the regression coefficients at the lowest possible level is most desirable. This can be accomplished by choosing the sample purposively, thus, increasing the variance of the observations and by recombining input categories which are highly correlated. Furthermore, it is necessary to distinguish clearly in the accounts between investments and expenses as well as productive and non-productive inputs.

In order to test the proposed methodologies independent enterprise functions and one aggregate function were fitted to detailed enterprise input-output data from 27 dairy-hog farms in northwestern Illinois. The Illinois records contained more detailed information than similar records kept at other experiment stations contacted in connection with this study.

A statistical analysis of the resulting enterprise function was carried out by testing the MVP of each production factor in each function against a minimum or reservation

MVP which should have been earned by these factors in northern Illinois in 1950. Comparisons of the geometric mean organizations with these minimum MVP's revealed no serious maladjustments on the farms studied while a comparison of individual farms whose organization deviated from that on the geometric mean showed very serious maladjustments.

The productivity estimates carried out indicated that on the average farm in the sample the returns to labor in hogs are significantly below the price which has to be paid for labor indicating that less of this factor should be applied in hogs.

Regarding the productivity of feed, it was concluded that when compared at the geometric mean the returns in both enterprises are just equal to the cost of feed.

The returns to land are high indicating that a possible expansion of the operations on these farms might be profitable.

A statistical comparison of the individual enterprise functions with the aggregate function indicated that the method of fitting individual enterprise functions furnishes more reliable information regarding individual enterprises than does the method of fitting one aggregate function to data from the entire farm business.

139 pages. \$1.74. Mic 56-1

#### THE WIREWORM COMPLEX ON SPENCER SILT LOAM SOIL

(Publication No. 14,779)

Edgar Merrow Raffensperger, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Dr. James W. Apple

The Spencer-Almena series of silt loam soils provide an environment conducive to the development of Agriotes mancus Say wireworms. This situation was brought to the attention of entomologists by agricultural extension workers who observed fields attacked by these insects in central Wisconsin. The Spencer soils in which the B-horizon is a hard-pan type of barrier to drainage, are wetter than other silt loams, such as Carrington silt loam, in which A. mancus wireworms seldom occur.

A. mancus occurs with Hypolithus abbreviatus Say in the Spencer soils, the latter species of elaterid being of little agronomic importance. In a survey of cultivated fields on Spencer soil, 30.1 per cent were found to be infested with wireworms. Eighty-four per cent of the A. mancus wireworms screened from the soil in the course of the survey were found on the rolling phase of the Spencer soil. Seventy-six per cent of the H. abbreviatus larvae occurred on rolling phase soil.

In an examination of crop sequences from the 73 fields included in the survey, it was noted that 61 per cent of the fields in hay during the second season before the survey

were found to be infested with wireworms when the survey was conducted. For crops in hay during the third year before the survey, 71 per cent were found to be infested during the survey.

Vertical migrations of *A. mancus* larvae in Spencer soil are limited. Since the larvae overwinter near the surface, they are in close proximity to the area where newly planted seeds germinate. Caged larvae survived the central Wisconsin winter at depths of 3, 6 and 9 inches. Starved larvae were unable to pass through a three inch layer of B-horizon soil to reach oats seedlings. (The B-horizon occurs just below the plow layer, at about 9 inches depth). In a moisture preference test wireworms were found to move away from very high and very low moistures in the soil.

Heavy infestations of wireworms do the most severe damage in corn, where feeding on the relatively small number of plants is most apparent. In addition to having a susceptibility to early-season damage, corn crops are less able than oats to recover from early losses. Actual loss of oats yields because of wireworm feeding was not demonstrated experimentally.

High populations of *A. mancus* wireworms, being restricted in area, might best be controlled by soil applications of insecticides. Such treatments could be applied broadcast, or in combination with starter-fertilizers. For economy such treatments could be limited to the severely attacked areas. Aldrin and heptachlor both gave good protection at the rate of two pounds of the toxicant per acre, as shown by tests near Marshfield, in Wood county.

Protection from wireworm attack with seed treatments is considerably less costly than protection with soil applications, because much smaller amounts of insecticides are used. Tests of seed treatments on both corn and oats have shown that losses of plants early in the season can be limited by the use of one ounce per bushel on corn, and one ounce per 100 pounds of seed on oats, of lindane, aldrin, dieldrin, or heptachlor.

Lindane is known to be somewhat phytotoxic to seeds and seedlings when used in large amounts, hence there is some danger to plants from accidental overdosage by farmers. This hazard does not appear to occur in the case of dieldrin, aldrin, and heptachlor.

There is apparently no interference between these insecticides and the commonly used seed fungicides, when the two materials are used together. Combination treatments employing these materials are being applied to seeds by growing numbers of seed producers, primarily for seed corn maggot control. Some wireworm control may be gained from the light dosages applied, but quantities of the insecticide (usually dieldrin) necessary for the most efficient wireworm control must be applied to seed by farmers.

126 pages. \$1.58. Mic 56-2

## AGRICULTURE, ANIMAL CULTURE

### FERTILIZATION AND EMBRYONIC MORTALITY RATES FOR BULLS WITH HISTORIES OF EITHER LOW OR HIGH FERTILITY IN ARTIFICIAL BREEDING

(Publication No. 10,571)

Henry Joe Bearden, Ph.D.  
Cornell University, 1954

The investigations reported in this thesis were designed to obtain direct and quantitative information as to the extent to which the bull may be responsible for the non-fertilization of ova and for the early death of the conceptus.

The general plan of the experiment was to breed heifers artificially to bulls with histories of either low or high 60- to 90-day per cent nonreturns in artificial insemination. One half of the heifers bred to each bull was then slaughtered 3 days post-estrus to determine fertilization rates, while the other half was slaughtered 33 days post-estrus to determine the percentage of normal embryos present. The difference between the fertilization rates and the percentage of normal embryos was considered to be embryonic mortality.

The fertilization rates were 76.9 per cent for 26 heifers bred to low fertility bulls and 96.6 per cent for 29 heifers bred to high fertility bulls and slaughtered 3 days post-estrus. The percentage of normal embryos from the same number of heifers slaughtered 33 days post-estrus was 57.7 for the low bulls and 86.1 for the high bulls. The percentage of heifers not pregnant because of embryonic mortality was 19.6 for the low bulls and 10.5 for the high bulls. The difference of 9.1 percentage units is not statistically significant at the 5 per cent level of probability. If this difference is a real one, about 350 animals would be required to obtain a statistical significance at the 0.05 level of probability with the variability encountered in this experiment. Only one abnormal embryo was recovered and its development apparently stopped between 20 and 25 days of age.

The 28- to 35-day per cent nonreturns to first service for the ejaculates used to breed the experimental heifers were 68.4 for the low bulls and 83.3 for the high bulls. The 60- to 90-day per cent nonreturns were 58.0 for the low and 74.4 for the high bulls. The difference in the per cent nonreturns based on the ejaculates used from the high and low fertility bulls is very close to the difference planned for the two groups of bulls.

Of 60 heifers slaughtered 3 days post-estrus 55 or 92 per cent of the eggs were recovered. The fertilized eggs from the low bulls ranged from 2 to 16 cells with a mean of 6.8 and a median of 8, while those from the high bulls ranged from 4 to 16 cells with a mean of 8.3 and a median of 8.

Twenty-nine of the embryos that were measured with calipers averaged 10.8 mm. from neck to rump and weighed on the average 177.13 mg. The difference in the average size of the embryos from the high and low bulls was not statistically significant. The standard deviations of 1.51 mm. for embryo length and 70.56 mg. for weight suggest that studies of embryonic development at a particular age can not be accurately done with unidentified slaughterhouse material.

Of the 141 heifers used in the experiment 10 or 7.1 per



cent had abnormalities of the genital tract. In 6 heifers the abnormalities were discovered by rectal palpation, while in the other 4 they were not discovered until the heifers were slaughtered.

None of the heifers had a positive reaction to *Vibrio fetus* or *Brucella abortus*. Histopathological examinations of the reproductive tracts failed to indicate possible causes of the difference in the percentage of normal embryos present at 33 days of gestation for the low and the high fertility bulls.

From the findings of this study the contribution of the bull to the problem of infertile matings consists of both non-fertilizations and embryonic mortalities. The high fertility bull appears to present a single problem, that of embryonic mortality. On the other hand, low fertility bulls present a dual problem. Some may have low fertilization rates with little embryonic mortality, while others have a higher fertilization rate, possibly as high as high fertility bulls, but may have a high incidence of early embryonic deaths. Finally, a combination of these two factors probably exists in some bulls.

As shown by matings to high fertility bulls, practically all eggs produced by normal heifers are capable of being fertilized. This indicates that in the case of fertilization failures, the bull is the contributing factor. Whether this factor is genetic or disease in nature will have to be answered by future research. As regards embryonic mortality, it appears that more research must be directed toward the first few days of gestation and the role of hormone imbalances.

83 pages. \$1.04. Mic 56-3

# STUDIES ON THE SERUM PROTEIN BOUND IODINE LEVELS AND SERUM CHOLESTEROL LEVELS OF THE CHICKEN

(Publication No. 15,296)

Harvey Lindy Bumgardner, Ph.D.  
University of Maryland, 1955

Supervisor: Professor C. S. Shaffner

An increased difference between two lines of New Hampshire chickens differing in weights of thyroid glands when thiouracil was fed was produced by one year of selection. The line of chicks with the largest thyroids when thiouracil was fed had the largest thyroids when thyroid stimulating hormone was injected. There was no difference in thyroid weights of control chicks of the two lines. It was concluded that there is probably a greater normal secretion of thyroid stimulating hormone by the pituitaries of the low responding line compensating for the lower response of the thyroid glands to thyroid stimulating hormone.

Mean serum protein bound iodine levels of 1.06 and 1.12 micrograms percent were found for two groups of chicks. It was concluded that serum protein bound iodine levels of chickens are lower than levels reported for most other animals. No significant difference was found between serum protein bound iodine levels of the high and low thyroid responding lines. Neither were significant differences found between sires within lines, nor dams within sires within lines. Treatment of chicks with 40 micrograms thyroxine per day caused serum protein bound iodine levels to rise to two and one-half times that of control chicks.

A mean serum cholesterol level of 152 milligrams percent was found in four-week-old New Hampshire chicks. No significant difference was found between the high and low thyroid responding lines of New Hampshires. A heritability estimate of .42 was computed for serum cholesterol levels of four-week-old New Hampshire chicks. Significant positive phenotypic and environmental correlations were found between serum cholesterol level and body weight at four weeks, but no significant genetic correlation. A mean serum cholesterol level of 153 milligrams percent was found in four-week-old flightless chicks. When data for the two strains of chickens were combined a heritability estimate of .48 was computed for serum cholesterol levels of four-week-old chicks. Significant positive phenotypic, genetic and environmental correlations between serum cholesterol level and body weight were found using the combined data of the two strains.

Seven-week-old chicks had higher serum cholesterol levels than five-week-old chicks, but this difference was not significant. Male chicks had significantly higher serum cholesterol levels than did females. Chicks of the flightless strain had significantly higher serum cholesterol levels than New Hampshire chicks.

An excess of choline had no effect on serum cholesterol levels. When 0, 15, 22.5 and 30% animal fat was added to chick rations in which the calory-protein ratio was kept constant, only the 30% level caused a significant increase in serum cholesterol levels. Treatment of chicks with thiouracil, estrogen and cortisone significantly increased serum cholesterol levels, but progesterone, testosterone and thyroxin treatments caused no significant changes.

Serum cholesterol levels of mature hens were considerably higher than serum cholesterol levels of mature male chickens. A significant negative correlation was found between serum cholesterol levels of hens and egg production.

145 pages. \$1.81. Mic 56-4

## AGRICULTURE, PLANT CULTURE

### NUTRITIONAL FACTORS AFFECTING PRODUCTION AND COMPOSITION OF SOYBEANS

(Publication No. 14,443)

Mack Drake, Ph.D.  
Purdue University, 1946

Major Professor: N. J. Volk

Two methods of fertilizing soybean plants were studied two years on Crosby silt loam, near West Lafayette, Indiana. (a) A crop of rye which had been heavily fertilized was plowed under as a green manure crop for soybeans. It was believed that the minerals absorbed by the green manure would reduce ionic concentration of the applied fertilizer salts, thereby avoiding injury to soybean germination and inoculation. (b) Fertilizer was broadcast and plowed under without rye. It was thought that the ionic concentration of the fertilizer salts in the soil solution would be reduced by increased absorption of cations by the soil colloids. By placing a large proportion of this fertilizer in the more continuously moist zone of the soil, it would be more

available to the plant during July and August, that period when the surface soil is often dry and when soybeans make a large part of their growth.

The use of a green manure crop was not necessary on this soil as green manure did not produce a greater increase in soybean seed yields than the same fertilizer treatments without green manure. The interaction between green manure and fertilizer treatment was not significant.

Placing the fertilizer deep in the plow layer, where the moisture relationship was more favorable to absorption of fertilizer elements in the exchangeable or ionic forms, was of greatest importance. Yield increases for the plow-under method over the shallow fertilizer placement were highly significant, 5.8 and 8.0 bushels in 1940 and 1941, respectively.

Three tons of limestone with a complete fertilizer plowed under yielded 4.3 bushels more than fertilizer without lime in 1940.

Yield response of soybeans to phosphorus indicated that the point of diminishing returns had not been reached with the method used to apply this element. Banding the phosphate 3 to 4 inches below the seed and banding on the plow sole should be studied in an attempt to find a more effective method of applying this element. Phosphorus increased the per cent protein and increased the yield of both oil and protein.

Although potassium deficiency symptoms were not completely corrected, 60 pounds of potash per acre increased the yield of soybean seed, increased the per cent of oil from 16.9 (NP) to 17.5 (NPK) per cent, and reduced the per cent of protein proportionately. Additional increments of potassium corrected deficiency symptoms and increased the quality of seed.

Yield of seed was not increased by nitrogen applied before planting. Nodulation was reduced by 40 pounds of applied nitrogen. Plants appeared to fix adequate amounts of nitrogen on this soil.

Yield increases produced by sulfur and magnesium were very small.

Plant tissue tests showed that during seed formation large amounts of available phosphorus and potassium are required by the soybean plant. These tests indicated that during seed formation, plants growing on highest fertility plots were using phosphorus and potassium as rapidly as absorbed by the plant.

To increase soybean yields on Crosby silt loam or similar soils low in fertility and organic matter, the soil reaction should be corrected to about pH 6.5 by applying ground limestone. A quantity of fertilizer containing 60 to 100 pounds each of  $P_2O_5$  and  $K_2O$  (0-1-1 ratio) per acre should be broadcast and plowed under.

96 pages. \$1.20. Mic 56-5

# THE AVAILABILITY OF THE PHOSPHORUS IN ROCK PHOSPHATE AS MEASURED BY THE PHOSPHORUS UPTAKE OF ALFALFA

(Publication No. 14,611)

David Orville Howe, Ph.D.  
University of Missouri, 1955

Supervisor: Ellis R. Graham

A series of experiments were performed to measure the availability of the phosphorus in rock phosphate as demonstrated by the percentage concentration of phosphorus in, and the total phosphorus uptake by, alfalfa plants grown in sand- Putnam clay cultures using rock phosphate as the source of phosphorus.

The differences in availability of the phosphorus in the rock phosphate in relation to different chemical treatments of the clay were so measured.

The different treatments of the clay were as follows:

- Different levels of exchangeable calcium saturation.
- Different levels of soluble calcium, magnesium, potassium, and sodium salts, ranging from moderate to excessive quantities.
- Low levels of exchangeable calcium saturation of the clay plus sparingly soluble organic salts of calcium.
- Varying quantities of clay.
- Varying quantities of rock phosphate.

In addition a study of the exchangeable root hydrogen was included and a study of the energy change between calcium and hydrogen in a Putnam clay-rock phosphate system. The energy change of calcium for hydrogen was calculated by the equation

$$\Delta F = 1364 \log \frac{a_{H^+}}{\sqrt{a_{Ca^{++}}}}$$

The following conclusions were drawn from the results obtained from these studies:

- The concentrations of phosphorus in the plants increased with increasing quantities of soluble phosphorus in the cultures, but the yields did not always increase. Growth factors other than the available phosphorus intervened in some cases to limit the yield.
- The rock phosphate served as a significant source of calcium to the plants, especially in those cultures with low saturations of exchangeable calcium on the clay.
- Calcium sulfate added to the cultures in increments of from 10 to 163 millimoles per liter of soil water had only a minor influence on the plant yields but reduced significantly the concentrations of phosphorus in the plants and the total phosphorus harvested from the cultures. Morphological characteristics of the plants in the higher treatments resembled a physiological phosphorus deficiency.
- Magnesium sulfate treatments gave erratic results in the concentration and total uptake of phosphorus by the plants as well as yield responses indicating the possibility of two conflicting reactions, one tending to decrease the phosphorus uptake the other tending to increase the uptake and the efficiency of the plant's utilization of phosphorus.
- Treatments of potassium sulfate and potassium carbonate indicated an insignificant or slightly positive



influence on the uptake of phosphorus from rock phosphate. Potassium chloride and potassium acetate reduced the crop yield and the uptake of the phosphorus by the plants. The latter results were attributed to the detrimental influence of the anions.

f. Treatments of sodium sulfate gave large reductions in yields and an erratic influence on phosphorus concentrations in the plants. This was attributed to the detrimental effect of the sodium ion.

g. Low degrees of calcium saturation of the clay increased the availability of the phosphorus from the rock phosphate to the plant.

h. From the comparisons of the results from the treatments of the cultures with various salts it was concluded that the energy of exchange of the hydrogen on the clay for the calcium in the rock phosphate was the determining factor in the availability of the phosphorus to the plants rather than the pH of the cultures.

i. Exchangeable hydrogen on the roots of the plants in the various treatments gave extremely high values in the order of 100 to 200 milliequivalents per 100 grams of oven-dry roots on the most stunted roots. The values for the healthy vigorous roots were in the order of magnitude of 20 to 30 milliequivalents per 100 grams. No consistent relation was observed between the exchangeable hydrogen and the uptake of phosphorus.

j. Results from the free energy change in the clay-rock phosphate systems indicated the  $\Delta F$  values between 5186 and 6807 calories are the desirable levels for best phosphorus availability from rock phosphate in Putnam clay.

k. It is proposed that the relations found for the Putnam clay-rock phosphate systems will obtain in any similar systems in which the energy of absorption for calcium is greater than that for hydrogen.

165 pages. \$2.06. Mic 56-6

# THE EFFECTS OF LIQUID NITROGEN FERTILIZERS ON THE YIELD AND CHEMICAL COMPOSITION OF CORN, OATS, AND WHEAT

(Publication No. 15,023)

Harold Franklin Kreizinger, Ph.D.  
Cornell University, 1955

In 1953 and 1954 the effects of rate, source, and time of application of various liquid nitrogen fertilizers were investigated at Mount Pleasant and Aurora, New York, which represent two entirely different soil types. Corn and oats were grown as the test crops, and in 1954 wheat was added at both sites. Measurement data included grain yield and test weight on small grains, tiller and head counts and plant height on oats, and total dry matter of the grain and straw on wheat. On corn the yields of grain and stover and the ear to stalk ratios were obtained. Total nitrogen was determined on the grain of all crops as well as stover and cobs of corn, wheat straw in 1954, and top and root samples of oats in 1953. In addition, the pounds of nitrogen per acre in the various parts were calculated at both locations for oat grain, corn grain, stover, and cobs in both seasons; oat tops in 1953; and for wheat grain and straw at Aurora in 1954.

The grain yields obtained in this investigation gave no general indication that one liquid nitrogen carrier was consistently superior to any other in the growing seasons of 1953 and 1954. At Mount Pleasant in 1953 the highest yields on oats were obtained with addition of 60 pounds nitrogen per acre as anhydrous ammonia at planting or 40 pounds nitrogen per acre of 32 per cent solution at Aurora. On corn the 40 pound nitrogen per acre rate of anhydrous ammonia applied at planting resulted in the greatest yield at Mount Pleasant, whereas at Aurora the same rate of the 40 per cent solution gave highest yields among the liquid fertilizers. Because of the adverse growing season in 1954, no great differences in yields were observed among the treatments on either oats, corn or wheat at both locations.

In 1953 and 1954 oat grain yields and weight per bushel were higher at Mount Pleasant than at Aurora, whereas the grain yield of corn was superior at Aurora during both seasons. Applications of liquid fertilizers to oats in 1953 and 1954 appeared to have little effect on either the number of tillers and heads or on plant height.

In general, application of the various nitrogen fertilizers had little effect on the per cent nitrogen contained in the plant tissues of oats, corn, or wheat at maturity or in the total amount of nitrogen removed by the crops in either 1953 or 1954. The 40 pound nitrogen per acre rate applied on corn at planting and the 20 pound application on oats at planting generally resulted in the most efficient use of nitrogen at both locations in 1953. However, in 1954 varying the rate, source, and time of application of nitrogen on corn, oats, and wheat produced no increase in the efficiency of its utilization.

It was concluded from this study that the effects which the various liquid nitrogen fertilizers produced on yield and chemical composition of corn, oats, and wheat were too small and variable to be considered different from each other or from those produced by solid ammonium nitrate.

230 pages. \$2.88. Mic 56-7

# SOME EFFECTS OF POTASSIUM NUTRITION AND FRUIT LOAD ON THE PEACH AS INDICATED BY FOLIAR ANALYSIS

(Publication No. 15,302)

John Popenoe, Ph.D.  
University of Maryland, 1955

Supervisor: Dr. L. E. Scott

Orchard grown peach trees of the Elberta, Halehaven, and Shippers Late varieties were given differential treatments including a soil application of potassium chloride and removal of the crop near the time of full bloom. Leaf samples were taken at four sampling dates each year for two years and at one sampling date each year for two additional years in one experiment while two other experiments were carried out for only one year. In a fourth experiment, the crop was removed from one main limb of each tree and separate analyses of the leaves were made from the bearing and non-bearing limbs. All leaf samples were analysed for nitrogen, phosphorus, potassium, calcium, and magnesium.

The application of potassium resulted in an increase



in the percentage of calcium and magnesium in the leaves. This effect was manifested for each of the four years of the project. The potassium fertilizer had no consistently significant effect on the levels of nitrogen and phosphorus. The removal of the crop resulted in a reduction in the percentage of nitrogen, calcium, and magnesium and an increase in the percentage of phosphorus and potassium in the leaves. Partial removal of the crop by thinning had a similar but rather small effect on these percentages. The effect of crop load was important only during the year in which the treatment was applied. The effects of both the crop load and potassium application generally were apparent by the last part of June. Removal of the crop from single limbs resulted in a decrease in the calcium level in the leaves of those limbs but did not greatly affect the levels of the other nutrient elements studied. It is suggested that the effects of crop load and potassium fertilization should be taken into consideration when leaf analysis data are used to estimate the nutritional status of peach trees.

54 pages. \$1.00. Mic 56-8

#### SOIL FACTORS AFFECTING THE GROWTH OF CARNATIONS

(Publication No. 14,291)

Jesse Melvin Rawson, Ph.D.  
Michigan State University, 1953

An investigation was made of the effect of several soil factors upon the production and growth of greenhouse carnations. The carnation seems to be less responsive to soil differences than other major cut flower crops and consequently has been little studied.

Northland carnations obtained from two sources were grown on three Michigan soils and under three methods of watering. All flowers were cut and graded for a six-month period. Total yields were generally similar but considerable differences were obtained between treatments when commercial or other quality grades were considered separately. Highly significant differences were obtained between plants from the two sources. This was believed to be due largely to differences in culture between time of propagation and time of benching. The clay loam soils produced more commercials and high quality flowers than did a sandy loam soil. Constant water level was the most variable method of watering but produced high quality flowers when plants from a commercial source were used.

Juno and Achilles carnations were grown in two clay loam soils in tiles cut to give five different depths of soil above a water table. Plant measurements included height increases, green weights, number, weights and lengths of all breaks and bottom breaks and flower and bud counts. Soil measurements included oxygen diffusion studies and moisture determinations at one inch intervals throughout the columns of soil. Four inches of soil above the water table retarded growth of plants in both soils. Growth was similar in the more stably aggregated and better aerated soil when five, six, seven and eight inch soil columns were used. In the less stably aggregated and poorer aerated soil growth improved steadily as depth of soil increased.

Adequate aeration of greenhouse soils perhaps is limiting more often than previously recognized. Heavy watering and use of improper soils and soil mixtures limits soil air.

In constant water level work the soil is usually not deep enough in the bench to provide proper aeration in the root zone. Evidence has been presented indicating that the depth of soil in a constant water level bench affect both shoot growth and morphological development of carnations. Improving soil aeration caused an increase in the growth and development of lateral buds with both pinched and unpinched plants. Growth substance produced in the apical tip which inhibits lateral growth may be inactivated by oxygen in the soil or its concentration may be reduced to such an extent that it becomes stimulating.

112 pages. \$1.40. Mic 56-301

#### CHEMICAL DEFOLIATION OF DRY BEANS

(Publication No. 15,434)

Robert Cheng-Wei Tang, Ph.D.  
Cornell University, 1955

Seventeen experiments and tests were conducted in the field and greenhouse during a period of three years, 1952, 1953, 1954, to test the effectiveness of various defoliant to hasten maturity of dry beans, to determine the effect of environmental factors and method of application on defoliation, and to determine the mechanism of abscission.

Endothal, which contains disodium 3,6-endoxohexahydrophthalate, and Shed-A-Leaf, which contains sodium chlorate and sodium pentaborate, were found to be the most promising defoliants for dry beans.

The defoliants Tumbleaf, De-Fol-Ate, Ortho C-1, and Aero-Cyanate, in several experiments gave good defoliation similar to Endothal and Shed-A-Leaf.

Different gallonages and different pressures used in applying defoliants gave no significant effects on defoliation when considered separately; however, the interaction between gallonage and pressure was significant. Low gallonage or high pressure generally caused more desiccation than high gallonage or low pressure.

After treating with defoliants, the more mature plants had higher percentages of defoliation and less desiccation than the immature plants.

When three varieties, Monroe, Yellow Eye, and Red Kidney, were treated with defoliants at the same time, a highly significant difference was obtained. Monroe is the earliest variety and showed the highest percentage of defoliation. Red Kidney which is the latest variety among the three, had the lowest percentage of defoliation.

In one experiment, there was no significant difference in yield between the defoliant-treated plants and untreated plants. In another experiment, the difference was significant. Some of the defoliant-treated plants were lower in yield than the untreated check.

Higher temperatures caused more defoliation in cases where Endothal and Shed-A-Leaf were applied.

Darkness caused more defoliation than light, which was especially evident on the untreated plants.

Low soil moisture, just above the permanent wilting point, gave higher percentages of defoliation and desiccation than where the soil moisture was near field capacity. This was especially evident on the plants which were not treated with defoliants.

Smaller droplets of sprayed defoliants in the greenhouse showed more effective defoliation, especially in the case of

Shed-A-Leaf which contains no wetting agent. Similarly, smaller sizes of nozzle were more effective than large ones.

Under the temperature of 50°F. to 60°F., the metaborate formulation of Shed-A-Leaf powder, Dry Shed-A-Leaf, and Endothal 4069 gave the best results of defoliation. There was no significant difference in desiccation among the 12 tested defoliant.

Shed-A-Leaf showed no translocation of the effect of the defoliant from the stem or petiole to the abscission zone. The treatment on the basal portion of leaflet or on the main vein was more effective than that on the apical portion of the leaflet for defoliation. The treatment on the lower leaf surface was more effective than that on the upper surface.

The reduction of the auxin activity due to adding Endothal appears to have been inversely proportional to the logarithm of the concentration of Endothal which was added.

During the abscission process, the separation layers of naturally matured leaves showed a series of new cell division and the separation started from the periphery to the center of the abscission zone. On the contrary, that of the Endothal-treated leaves showed no new cell division in the abscission zone and the separation started from the central portion of the abscission zone and expanded to the periphery. The reason may be due to the extreme rapidity of the progression of the abscission process.

143 pages. \$1.79. Mic 56-9

#### PHYTOTOXICITY AS A RESULT OF HEAT TREATMENT OF SOIL

(Publication No. 15,438)

John Wiebe, Ph.D.  
Cornell University, 1955

Soil is frequently heated to destroy disease-causing organisms before use in glasshouse culture. This treatment usually results in better plant growth but a temporary retardation commonly occurs immediately after treatment. The reason for the reduced plant growth following heat treatment of soil was the subject of this study.

Many reasons are offered in the literature for the phytotoxicity following heating of soil. Among the more common are excess ammonia, high soluble salts, minor element toxicity, destruction of soil structure and production of "toxin." Heating of soil increases the solubility of both inorganic and organic constituents of the soil. This results in an increase in the osmotic concentration of the soil

solution. The working hypothesis for this research was that the increased osmotic concentration causes physiological unavailability of the water to the plant roots.

It was demonstrated that germination and early growth of several species decreases directly with increases in osmotic concentration. The bio-assay used in most of the work was Burpee Hybrid cucumber pregerminated and grown under test conditions for 24 hours at about 30°C.

A glasshouse soil that had given poor plant growth following steaming was obtained. This soil was screened, moistened and mixed, then stored at room temperature for several months. Samples of soil were subjected to four temperature treatments (70, 100, 125, or 160°C.) for three treatment durations (1, 4, or 7 hours.) The samples were then incubated for four periods (0, 4, 8, or 12 days). A 1:2, soil:water extract was made of each sample. The extract was tested for concentration of ammonia, soluble organic matter content, electrical conductance, osmotic concentration (by measuring freezing point depression) and for phytotoxicity.

With increasing treatment temperatures there was an increase in each of the measured factors. Increasing the duration of the treatment or the incubation period did not cause any large changes.

A significant simple correlation existed between any pair of measured factors. Freezing point depression was highly correlated with electrical conductance, as was soluble organic matter with ammonia. Plant response gave a slightly higher "r" value with freezing point depression than with the other factors. A partial correlation analysis indicated that electrical conductance and freezing point depression correlated better with plant response than did soluble organic matter or ammonia. An analysis of covariance showed that as treatment conditions change, freezing point depression paralleled the plant toxicity of the extract very closely, giving "r" values of over -.98.

In an attempt to isolate a "toxin" from the soil extracts, the solids of the extract were separated electrophoretically, with exchange resins and by use of organic solvents. No conclusive results were obtained.

Soil was heated and brought to the third-atmosphere percentage and a cryoscopic determination made. A great increase in the tension with which the water held was demonstrated.

The author believes that the increase in osmotic concentration of the solution in a freshly sterilized soil is frequently high enough to account for marked reduction in plant growth.

95 pages. \$1.19. Mic 56-10

#### ANTHROPOLOGY

##### A STUDY OF SOME OFF-RESERVATION NAVAHO MINERS

(Publication No. 15,417)

Ralph August Luebben, Ph.D.  
Cornell University, 1955

Because the resources of the Navajo Reservation are incapable of supporting the population, continuous expansion

of local resources and resettlement of a large number of Navahos in off-reservation communities with opportunities for permanent employment is desirable. Since World War II, when an acute labor shortage developed, the mines in Rico, Colorado, have continued to offer excellent opportunities for permanent off-reservation employment. In this paper, data relating to the actual mining situation in Rico is presented in terms of Navaho activity, interaction, and sentiments.



A third of the population in Rico is Navaho, most of whom come from the northeastern, comparatively acculturated portion of the reservation and adjacent on- and off-reservation areas. Many of the Navaho personnel are related to others employed in the mines. Those who apply for work tend to be youthful and need cash, but none takes advantage of the resettlement facilities offered by the government. Navahos are hired, and frequently rehired, as helpers. While they are regularly promoted to miner, none hold any of the more highly skilled ratings above miner or supervisory positions. Navahos form a majority of the underground employees, but a minority of the total work force. Little of their previous educational and occupational experience is of any value in hard rock mining. Fundamental mining techniques are readily acquired by working as a helper to an experienced miner and by subsequent imitation. Navahos are quite competent miners within the sphere of their training and experience.

Navahos are not reluctant to work underground. As miners, they are at least average and generally have their supervisor's confidence; however, a few were really experts. Supervisors can depend on them to finish assigned tasks, and in many cases, they are completely self-sufficient. Navahos need specific training in three areas: 1) servicing of equipment, 2) handling explosives, and 3) mine sanitation.

Usually mining is just another job and means a temporary income rather than being the basis for status and economic security. Nearly half of the Navahos earn more than \$1500 per year, which was the basis for Navaho self-sufficiency in 1952. Rates of absenteeism and turnover are much higher than for Anglo employees. Unacceptable absences are largely due to drinking and reservation visits. Moreover, the reservation continues to exert a strong attraction for Navahos and remains a convenient economic cushion.

Navahos reject traditional limitations placed on earning money and prefer working on a contract basis, so as to make as much money in as short a time as possible. Their general financial condition is characterized by the lack of ready cash and accumulated savings. The mercantile continues to serve as a trading post by extending credit and cash loans to Navahos. Their wages are assigned to the store by a legally questionable arrangement.

Navahos like mining as an occupation, and Rico as a community in which to live. The work is cool, easy, well paying, and relatively free of close supervision. Rico is cool, conveniently located near the reservation, and has a pleasing concentration of Navahos. Besides, liquor has always been available.

Rico Navahos manifest a considerable range of personality types. Navahos find it difficult to cooperate on the basis of "groups." On the other hand, most Navahos leisurely prepare for work and tend to be slower, but steadier, than Anglos on the job. They are invariably reserved and uncommunicative, and volunteer information only after good rapport is established; however, they are invariably inquisitive.

Apart from the involuntary mine associations, voluntary interaction usually precipitates two separate groups: Navahos and Anglos; and single individuals thrust into the opposite group are usually excluded from full participation. Most individual cross-cultural relationships follow a joking pattern. Within the Navaho group, a clearly defined "pecking order" exists.

On the involuntary level, considerable variation in the degree of success is noted for Anglo-Navaho partnerships. Personnel prefer working with a member of their own group but tolerate other work associates. Several supervisors indicate that an all-Navaho crew is wholly acceptable; however, some discriminatory treatment of Navahos is evident. The inability of Navahos to speak and understand English remains a major barrier to personal and industrial adjustment in American society.

Data point to three conclusions. First, despite the opportunities available and continual emphasis by governmental and tribal agencies on the advantages of permanent off-reservation employment and resettlement, Navahos do not take full advantage of them. Secondly, even though some undesirable features are associated with Navaho employees, they generally are willing and competent workers if properly trained. Lastly, much of the normative Navaho behavior of about 1940 is still apparent in the Rico Navahos.

377 pages. \$4.71. Mic 56-11

### SAINTS AND SPIRITS: A STUDY OF DIFFERENTIAL ACCULTURATION IN COLOMBIAN NEGRO COMMUNITIES

(Publication No. 15,158)

Thomas James Price, Jr., Ph.D.  
Northwestern University, 1955

The present study is one of differential acculturation in the religion of two Colombian communities, El Manzanillo, a village on the Caribbean Coast north of Cartagena, and Tumaco, an urban center on the Pacific Coast, whose ways of life have developed from similar African antecedents within the structure of the same European-derived culture.

Two aspects of religion that the Negro brought with him from Africa, the cult of the dead and the worship of the gods, have been syncretized with two aspects of the Catholic faith, the rites for the dead and the ritual practices involving the saints, respectively. However, this common religious framework has been embellished with marked dissimilarities in beliefs and practices in the two communities, and the framework itself has been subject to a shift in emphasis to the extent that different components of it have come to constitute the principal focus of religious concern in each, with corresponding ramifications into other social and economic institutions.

The rites for the dead in El Manzanillo occupy the most prominent position in religious activity. The spirits of the dead are conceived as the most effective supernatural aid, but are also believed to be potentially dangerous if the proper observances are not accorded them. The power which the dead have for both good and evil is clearly seen in their function in witchcraft, employed for both curing and doing injury. The rites for the dead require the larger share of the economic surplus, and the specialists who are primarily concerned with them are accorded the highest social status and are the figures with greatest prestige.

The saints are of secondary importance. Assistance by them is not guaranteed and they are not believed to take as active an interest in daily affairs as do the family dead. Public rituals for the saints, relatively infrequent, are of



minor economic significance, and there are no religious specialists whose major interest is their worship.

In contrast, religion in Tumaco centers about observances for the saints, to whom the individual appeals both for great favors and for aid and protection in daily activities. The public form of ritual, the *belén de santo*, is the major service involving group activity, and has repercussions in the economic field arising from the fact that the observance necessitates the allocation of the major share of the economic surplus of the individual who offers it. In terms of social structure, the women who sponsor it fill positions of greatest importance.

In Tumaco, it is not generally believed that the family dead are capable of aiding their living descendants, nor that there is great danger of harm to those who have not performed the proper rites. The wake and its associated

practices are of lesser importance in the life of the family and of the community.

It is apparent that the particular historical circumstances in these two areas have made for selective reinterpretation. It is necessary for the reinterpretation of the ancestral cult in El Manzanillo to be referred to the historical role of Catholicism which made distortions of worship of the saints difficult to sustain. In the Pacific area, on the other hand, the relative weakness of Catholic control has made it possible to reinterpret the saints in terms of the functioning of the African deities, with the ancestral cult assuming its normal West African position. It is thus apparent, in accordance with the basic hypothesis of this thesis, that universal process of reinterpretation under culture contact can only be effectively analyzed in the light of the particular historical situation under which this has occurred.

243 pages. \$3.04. Mic 56-12

## BACTERIOLOGY

### THE NEUROPATHOGENIC PROPERTIES OF NEWCASTLE DISEASE VIRUS:

#### I. THE TOXIC FACTORS OF NEWCASTLE DISEASE VIRUS.

#### II. RELATION OF THE NEUROPATHOGENICITY OF NEWCASTLE DISEASE VIRUS TO ITS INFECTIVE AND INVASIVE PROPERTIES.

(Publication No. 14,777)

Elizabeth Upton Platt, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor C. A. Brandly

Many strains of Newcastle disease virus possess the ability to elicit nervous signs in intracerebrally injected weanling mice; these signs appear in the absence of detectable virus proliferation. The specific property responsible for the observed nervous reactions has been designated the neuropathogenic factor.

Neuropathogenic strains in the form of undiluted allantoic fluids elicited rapidly fatal nervous signs in less than 24 hours. The clinical signs suggested a toxic reaction. Three strains of Newcastle disease virus, RO, CG179, and 11914FD elicited nervous signs in mice after intracerebral injection of virus dilutions approaching the limit of embryo infectivity.

Both toxic and delayed neuropathogenic manifestations of strain RO were neutralized by homologous immune serum. The neuropathogenic factor of strain RO was sedimented along with the embryo infectivity and hemagglutinating activity. When the ELD<sub>50</sub> of strain Naj was increased over 200-fold by ultracentrifugation, the concentrated material did not elicit typical neuropathogenic signs in mice. At 8 C the neuropathogenic activity of strain Milano was adsorbed on red blood cells along with the hemagglutinin and embryo infectivity. None of the 3 properties of strain RO were adsorbed at this temperature but some adsorption of hemagglutinin and neuropathogenicity was detected at 37 C.

The neuropathogenic factor of strains CG179, RO, 11914FD and Cle was in general apparently less stable to the effects of heating and cold storage than was the chicken embryo infectivity. Both properties were apparently less stable than the hemagglutinin.

Weanling hamsters were severely affected by most strains of Newcastle disease virus including those which had little effect on weanling mice but they did not manifest a "toxic" reaction.

After intravenous or intraperitoneal injection with some strains of Newcastle disease virus, mice died with signs of a toxic reaction characterized by intestinal hemorrhage and a hyperemic liver. However, there was no apparent relationship between the ability of a strain to cause such visceral toxic reactions and the degree of neuropathogenicity it possessed. Pregnant mice intravenously injected with strain B1 were severely affected although this strain had no effect on males or nonpregnant females.

#### II. Relation of the Neuropathogenicity of Newcastle Disease Virus to its Infective and Invasive Properties

The relationship of the neuropathogenicity of Newcastle disease virus to its proliferative and invasive properties was examined. Strains with either high or low neuropathogenicity were found to be equally unable to proliferate in the weanling mouse brain. Highly neuropathogenic strains as well as those possessing little neuropathogenicity were able to proliferate in the suckling mouse brain. One strain which lacked neuropathogenicity, even for chickens, failed to proliferate in the brain of suckling mice or in fetal mice or fetal guinea pigs.

Confirmatory evidence was presented for the observation that highly virulent, field strains maintained by passage in embryonating eggs in addition to possessing a specific toxic factor, elicited signs earlier and manifested greater invasive powers than less virulent strains.

It was demonstrated by serial passage in suckling mice that certain properties of Newcastle disease virus e.g., its ability to affect chickens rapidly, its invasiveness and its

neurotoxicity for mice, varied independently of each other. One line was obtained which had a greatly increased mouse neurotoxicity and a slightly increased ability to invade the chicken brain. On intracerebral injection it killed chickens more rapidly than the parent strain. The other line maintained its neurotoxicity for mice but lost all ability to invade the brain of chickens; it affected intracerebrally injected chickens only occasionally and after an extended incubation period. This same line also lost most of its ability to proliferate in the embryonating egg. It required a much longer time to kill the embryo than did the parent strain.

215 pages. \$2.69. Mic 56-13

#### STUDIES ON THE ISOLATION OF AGENTS FROM TUMORS

(Publication No. 14,293)

Leck Tanasugarn, Ph.D.  
Michigan State University, 1953

Many tumors of both animals and man have been reported to be caused by viruses, for example, Rous sarcoma (Rous 1910), mouse mammary carcinoma (Bittner 1936), human papilloma (Wile and Kingery 1919), and infectious myxomatosis (Rivers 1926).

In this experiment 17 tumors were obtained from both animals and man. Both tissue culture and serological methods were used in an attempt to isolate the causative agents of these tumors.

Nine tumors grew well in tissue culture. There was no correlation between origin or type of the neoplasm and growth *in vitro*.

Concentrated tumor allantoic fluid, representing the fifth passage of tumor extracts through embryonated chicken eggs, retarded the growth of normal chicken heart tissue in cultures. One exception was encountered in which exceptional growth occurred.

When such concentrated allantoic fluids were tested for hemagglutination with normal chicken cells, no reaction occurred. Concentrated tumor allantoic fluid in many cases produced hemagglutination of chicken erythrocytes previously sensitized with Newcastle disease virus or modified with trypsin. When the concentrated allantoic fluid was tested for hemagglutination with sensitized or modified cells between each passage, hemagglutination was frequently observed. None of the 17 tumors studied contained an agent that was capable of producing hemagglutination through all five consecutive serial passages.

No interference, *in vitro* or *in vivo*, could be detected between concentrated allantoic fluid tumor passage material and Newcastle disease virus.

114 pages. \$1.43. Mic 56-14

#### MORPHOLOGICAL AND PHYSIOLOGICAL CONSIDERATIONS OF COLONIAL VARIANTS OF *PSEUDOMONAS AERUGINOSA*

(Publication No. 15,110)

Clarence Kelly Williamson, Ph.D.  
University of Pittsburgh, 1955

This investigation was based on the bacterial variation of *Pseudomonas aeruginosa* as it is related to colonial form, cellular morphology, biochemical characteristics, and pathogenicity. This study was prompted by the discrepancies existing in the literature resulting from the failure of investigators to recognize the close correlation existing between the morphological and physiological attributes of bacteria.

Smooth (S), mucoid (M), and filamentous (F) colonial variants of *Pseudomonas aeruginosa* (ATCC 10145) were isolated from an SR parent. These variants were obtained by the following methods: the smooth state by serial transfer on Difco tryptone glucose extract agar; the mucoid state by serial transfer in BBL eugon broth enriched with four per cent potassium gluconate and on a solid modification of Haynes' media; and the filamentous variant by peripheral selection from sectors of colonies on nutrient agar and by serial transfer in nutrient broth. The representative colonies have been stabilized on the respective media noted above. Some of the correlative characteristics included: for the smooth state: nonencapsulated, monotrichate, and motile; for the mucoid state: encapsulated, monotrichate, and motile, although the flagella were masked by capsular material in cultures grown on solid substrates; for the filamentous variant: nonencapsulated, nonflagellated, and nonmotile. Further, pathogenicity studies, performed on albino mice, showed the superior toxicity of the mucoid state as compared to that shown for the filamentous variant, and to a lesser degree, for the smooth state.

Significant utilization of carbohydrates was observed for the colonial variants as follows: smooth cells oxidized glucose, xylose, and galactose to a pH of 4.6, 4.4, and 5.1, respectively, in ten days; mucoid cells oxidized glucose and xylose to a pH of 5.7 and 5.4, respectively, in ten days but did not attack galactose or arabinose; and filamentous cells oxidized glucose, xylose, galactose, and arabinose to a pH of 4.3, 4.2, 4.7, and 4.5, respectively, in ten days. None of the colonial types attacked lactose or sucrose. These sugars, and the nutrient broth controls, all reached a limiting pH between 8.4 and 8.8.

Amino acid utilization studies were performed using washed cells of *P. aeruginosa* variants in the following pH 7.4 phosphate buffered amino acid solutions: glycine, alanine, valine, leucine, isoleucine, serine, threonine, cysteine, methionine, aspartic acid, glutamic acid, lysine, and phenylalanine. Utilization was measured by a quantitative chromatographic, elution-colorimetric method. All of the amino acids were utilized, to some extent, by at least one of the colonial forms of *P. aeruginosa*. The filamentous variant was the most active in utilizing a greater range of amino acids while the mucoid state was least active. Aspartic acid, isoleucine, and alanine were utilized by all colonial forms to greater extent than other amino acids, and serine was utilized least. Approximately one-fourth of the available glutamic acid was used by the smooth and mucoid states but not by the filamentous variant, while



27 per cent of the available glycine and 17.5 per cent of the available cysteine was used by the filamentous variant but not by the smooth and mucoid states.

Washed cells of all the colonial forms synthesized glutamic acid to some degree when suspended in approximately equimolecular concentrations of aspartic acid and alpha ketoglutaric acid. The smooth and mucoid states synthesized glutamic acid twice as fast as the filamentous

variant although the smooth state was slightly superior to the mucoid state in transaminating ability.

The disparity of results shown to exist between the different colony types serves to support the writer's original premise that in both basic and applied aspects of bacteriology, attention must be given to the morphological attributes of the micro-organisms under study.

68 pages. \$1.00. Mic 56-15

## BIOGRAPHY

## ISAAC NORRIS II, THE SPEAKER

(Publication No. 13,416)

William T. Parsons, Ph.D.  
University of Pennsylvania, 1955

Supervisor: Dr. Leonidas Dodson

Isaac Norris II, a member of the Society of Friends, was one of the leading political figures of the Province of Pennsylvania in the middle eighteenth century. He served in the Pennsylvania Assembly from 1735 to 1765, nearly half that time as Speaker. He presided over the legislature during its struggle against proprietary dictation and helped maintain the Quaker influence in that body during the trying colonial wars of that period. The Assembly, and the Charter of Privileges of 1701 under which it functioned, constituted the most important aspects of government in Norris' eyes. The Assembly was a unicameral legislature under that charter and it was this feature that appealed to him. Norris ordered the Liberty Bell to celebrate the fiftieth anniversary of this Charter of 1701.

Norris' father had been active in political, business and religious affairs of Pennsylvania, so it is not surprising that Isaac Norris II had similar interests. The son took a less active part in business, and still less in religion, than Isaac Norris I had taken, although in his political career, both religious and business backgrounds served him well. Isaac Norris II was a transition figure in colonial Pennsylvania, being less closely associated with the Proprietors and the Society of Friends than were earlier Assembly

leaders, but effecting the necessary defense measures which the stricter Quakers refused to sanction.

While Isaac Norris was Speaker he and Benjamin Franklin worked closely for a number of years. They cooperated to limit the power of the colonial governor and consulted often on Assembly policy. Norris and Franklin finally split on the question of royal government for Pennsylvania, and Isaac ended his political career in the for him rather unfamiliar role of defending the proprietors.

Isaac Norris II was a leading citizen of Philadelphia. He was independently wealthy and was a large landholder, who was concerned in the commerce of the port of Philadelphia. There were few men in colonial Pennsylvania who had a finer home and a more extensive library than Norris had. Astronomy, medicine and gardening each held an interest for him. Family ties of Isaac Norris II included Thomas Lloyd, James Logan and John Dickinson as well as some other prominent Pennsylvanians.

Previously confused references to the early life of Isaac Norris II and the condition of his entry into politics have been clarified in this study. Similarly a distinction between the accomplishments of Isaac I and Isaac II has been made.

The main sources of information for this study are the Manuscript Collections of the Historical Society of Pennsylvania and the Dickinson College Rare Book Collection, the Votes of the Pennsylvania Assembly, Pennsylvania Archives and Colonial Records. Family letters, business accounts and official records have been examined at length in the preparation of this work, and the picture of Isaac Norris II which is herein presented has been drawn from these documents.

336 pages. \$4.20. Mic 56-16



## BIOLOGY-GENETICS

### IMMUNOGENETIC STUDIES OF THE RED BLOOD CELLS OF CHICKENS AND PHEASANTS

(Publication No. 14,679)

Martin Max Bacharach, Ph.D.  
The University of Wisconsin, 1955

Supervisors: Professor W. H. McGibbon and  
Professor M. R. Irwin

Titration of normal bovine serum against the red blood cells of chickens revealed the presence of three classes of reactors, weak, intermediate, and strong. Agglutination tests with bovine serum absorbed by an excess of the cells of weak reactors caused the cells of strong reactors to be agglutinated after two hours of incubation at room temperature, the cells of intermediate reactors were clumped only after overnight storage in a refrigerator, and those of weak reactors were not agglutinated.

When the bovine serum was absorbed with just enough erythrocytes of weak or intermediate reactors to remove the activity for the respective absorbing cells, the cells of other weak or intermediate reactors were still agglutinated by these fluids. Absorption with excessive quantities of erythrocytes of weak or intermediate reactors removed the agglutinins from cattle serum for all weak, as well as all intermediate reactors without diminishing the reactivity of strongly reacting cells, pointing to the existence of quantitative variations within the weak and intermediate reactor classes, as well as between these two classes of reactors, while these appeared to differ qualitatively from strongly reacting cells. Differential agglutinations within the strongly reacting class following absorptions with large quantities of strong cells suggested the existence of qualitative differences among the cells of strong reactors. The cells of weak or intermediate reactors were not agglutinated by this test fluid.

Based on the differential agglutinations of the erythrocytes of over 400 chickens, representing three inbred lines and involving up to 8 generations in some families, with cattle serum reagents, a genetic model was developed which can account for the existence of different types of weak, intermediate, and strong reactors, respectively. This model supports the hypothesis that the agglutination reaction of chicken erythrocytes with cattle serum absorbed by the cells of weak reactors can be explained by proposing four antigenic specifications,  $A^7$ ,  $A^5$ ,  $A^4$ , and  $A^3$ . According to the model, strong reactors may be of genotype  $A^7/A^7$ ,  $A^7/A^5$ ,  $A^7/A^4$ , or  $A^7/A^3$ , intermediate reactors may be  $A^5/A^5$ ,  $A^5/A^4$ ,  $A^5/A^3$ , or  $A^4/A^4$ , while weak reactors may be  $A^4/A^3$  or  $A^3/A^3$ .

The cells of strong reactors also were agglutinated by a reagent prepared from isoimmune sera of chickens, recognizing an antigenic substance called A7. Only four chickens were found among over 450 tested in a single line, Wisconsin Line No. 3, which were exceptions to this rule that the cells of strong reactors were agglutinated also by

the A7 reagent. The cells of these four exceptional birds belonged to the intermediate class according to their agglutination with antibodies of cattle serum, but they reacted with the A7 reagent. The erythrocytes of these four chickens removed antibodies from cattle serum for cells of some strong reactors, but not for all. Matings of the four intermediates to a sire of the weak class yielded weak, intermediate, and strong progeny. The action of an inhibitory mechanism, possibly a suppressor gene, is proposed to explain these observations.

Bovine serum was shown to possess normal antibodies for the cells of chickens, pheasants, their  $F_1$ -hybrids, turkeys, Mallard ducks, and Chukar partridges. Agglutination tests with test fluids prepared by absorbing bovine serum with the cells of pheasants or chickens suggested the presence of species-specific agglutinins.

The red blood cells of all chick embryos tested between 7 and 12 days of incubation were agglutinated by cattle serum absorbed by the cells of weak reactors; the aggregates of cells resembled rouleaux and rosettes. However, differential agglutination of these cells was observed in tests with the A7 reagent. After the embryos had been incubated 13 or more days their erythrocytes were agglutinated according to expectation of the cells of adults, i.e. the strong cells were agglutinated also by the A7 reagent and the cells of weak, intermediate, and strong reactors could be distinguished on the basis of rate or absence of reaction. It is suggested that bovine serum contains normal antibodies for the red blood cells of 7 to 12 day-old embryos, but that the source of origin of these cells may be a determining factor to account for their reactions with cattle serum reagents.

Hybrids between chickens and pheasants possess an antigenic substance of the red blood cells not found in either parent. Antibodies to this hybrid substance were produced by immunizations of pheasants. This new specificity was not demonstrated on the cells of 8 species and subspecies of pheasants. The hybrid substance in the cells of the  $F_1$  probably resulted from the interaction of complementary genes.

109 pages. \$1.36. Mic 56-17

### VARIATIONS IN THE BLOOD-CHEMISTRY OF TURTLES UNDER ACTIVE AND HIBERNATING CONDITIONS

(Publication No. 14,404)

Kenneth Earl Hutton, Ph.D.  
Purdue University, 1955

Major Professor: Clarence J. Goodnight

Certain aspects of the blood-chemistry were investigated in two species of turtles. These were the terrestrial common box turtle, *Terrapene carolina carolina* (Linne), and the aquatic Troost's turtle, *Pseudemys scripta troostii* (Holbrook). Since these species are related to the extent

that they both belong to the family Emydidae, it was hoped that any physiological differences found could be correlated with differences in modes of life. These species were also studied while in the torpid state of hibernation to determine what physiological adjustments occur in meeting the stress of the cold northern winter.

All organic components and the majority of inorganic components were determined on a monochromatic colorimeter. Sodium and potassium were evaluated on a flame photometer. Calcium was evaluated chemically after the flame photometer proved unsatisfactory. Erythrocyte counts were also made, and coagulation time was determined with standard capillary tubes for this purpose.

Comparison of the two species under active conditions reveals general similarities in glucose, total nitrogen and protein nitrogen. Small amounts of ammonia were invariably present although little to no urea was indicated. *Terrapene* possessed slightly higher concentrations of creatinine and significantly greater amounts of non-protein nitrogen and uric acid. Inorganic ion concentrations were somewhat similar although sodium chloride was significantly higher in the terrestrial form. Surprisingly low concentrations of serum calcium were found. Erythrocyte counts were similar although coagulation was decidedly shorter in *Terrapene*. Thus while some species variations in physiology do follow ecological considerations, others apparently do not.

Comparison of the two species under active and hibernating conditions revealed significant increases in blood glucose and uric acid in both species during hibernation. Concomitantly, inorganic sulfate increased while inorganic phosphate and magnesium decreased. Erythrocyte count also increased in both species under hibernating conditions. Except for these items, the components of the blood maintained a homeostatic consistency upon entering hibernation. It is this general homeostasis, this lack of change or relatively small change, which is probably the most remarkable point of note in this comparison of active and hibernating animals. 55 pages. \$1.00. Mic 56-18

#### THE ROLES OF NEURAL AND NON-NEURAL TISSUES IN LENS INDUCTION

(Publication No. 15,373)

Antone Gardner Jacobson, Ph.D.  
Stanford University, 1955

Although induction of the lens of the eye in amphibians has been studied extensively, some problems have remained unresolved. A mass of evidence indicates that the optic vesicle has an active role in lens induction, but in some species a lens is able to develop in the absence of the retina. This study is an investigation of the factors involved in the elicitation of a lens from the epidermis under various experimental conditions.

Embryos of *Triturus torosus* were kept at temperatures ranging from 5°C. to 25°C. until the early neurula stage, when the right retinal rudiment was excised. Lenses developed in the absence of the retina in all temperatures groups, but most frequently in the 16°C. group.

Lenses developed in gastrula epidermis in 71 per cent of the cases when implanted in the lens site of early neurulae, but in only 28 per cent of the cases when implanted in late neurulae.

No lenses formed in presumptive lens epidermis isolated *in vitro* from early or even late neurulae. When presumptive lens epidermis from the early neurula was isolated together with the subjacent entodermal archenteron wall, lenses formed in 31 per cent of the cases. When isolated with both the archenteron wall and the anterior lateral plate mesoderm, lenses formed in 42 per cent of the cases. When isolated together with the anterior lateral plate mesoderm alone, lenses formed in 14 per cent of the cases. When isolated with flank mesoderm, lenses formed in 10 per cent of the cases.

Ventral flank epidermis from the early neurula isolated together with both the archenteron wall from beneath the presumptive lens epidermis, and the anterior lateral plate mesoderm did not form lenses.

Presumptive lens epidermis and the retinal rudiment from the early neurula were isolated together *in vitro*. Of sixty-five cases, only two (3 per cent) formed lenses, and one of these was in the only explant in which mesenchyme had accidentally been included.

The defect experiments demonstrated that the retina is not essential for lens formation. The grafting and explant experiments showed that the non-neural tissues underlying the presumptive lens epidermis during neurulation are active in and essential to lens formation. These non-neural tissues can by themselves induce lens formation, which accounts for the formation of lenses in the defect experiments.

It is concluded that a lens is normally induced by the synergistic action of at least two inductors, the non-neural tissues underlying the presumptive lens epidermis during neurulation, and the retina. 80 pages. \$1.00. Mic 56-19

#### ISOLATION AND MORPHOLOGICAL STUDY OF A THERMOPHILIC CELLULOSE DIGESTING ORGANISM

(Publication No. 15,077)

Lloyd Yost Quinn, Ph.D.  
Purdue University, 1949

Major Professor: P. A. Tetrault

The present work was undertaken for the purpose of isolating a thermophilic cellulose digester in pure culture. Pratt was able to purify the culture which Murray obtained from horse manure, but he was unable to grow the organism on non-peptone medium; on peptone medium it grows as a surface spreader. The development of an optimal medium for cellulose digestion, in which yeast extract is substituted for peptone, known concentrations of mineral elements in distilled water replace tap water, and certain non-toxic reducing agents poise the oxidation-reduction potential at an optimal level, has resulted in successful colonial isolation of the cellulose digesting organism. Isolates have been obtained which attack cellulose with undiminished activity on serial transfer on the optimal medium, D58.

This organism is a microaerophilic, motile, flexible rod whose optimal temperature for cellulose digestion lies between 62-65°C. Oval spores are formed terminally to slightly subterminally, and the Gram stain is positive for young cells, but negative for older more filamentous cells.



Spirochetal forms present at certain periods in this culture are presumed to be the manifestation of one stage of a life cycle. 113 pages. \$1.41. Mic 56-20

**A STUDY OF GENETIC DIFFERENCES  
IN LYSOZYME CONCENTRATION IN  
THE EGG WHITE OF DOMESTIC FOWL**

(Publication No. 15,439)

Frank Herbert Wilcox, Jr., Ph.D.  
Cornell University, 1955

Variation in the lysozyme concentration of the egg white of domestic fowl has been studied. Statistically significant differences were shown between twelve strains but not between four breeds studied. An analysis of seven eggs laid by each of 62 hens during the first laying year showed a substantial decrease in lysozyme concentration with time, which was partially associated with an increase in egg weight. A positive regression of lysozyme concentration on egg weight within hen and time was only significant at the ten per cent level, but was shown to be highly significant in a previous experiment. The repeatability of lysozyme concentration of eggs laid eight weeks apart was 0.69. The decrease in lysozyme concentration during the pullet year was largely erased at the start of the second laying year.

Two families from each of two strains of White Leghorns were selected as being high and low in lysozyme concentration on the basis of previous investigation, and exceptional hens from each were mated with males from comparable families. Eggs of their female progenies, termed the second generation K High, K Low, C High, and C Low lines, were analyzed for lysozyme concentration, as were the blood sera of their male progenies. Exceptional individuals were used in pure-line and opposite-line matings, and the eggs of their daughters (third generation) were analyzed for lysozyme.

The second and third generations of the K High and K

Low lines regressed little towards or away from the flock average. The reciprocal crosses differed only slightly between themselves, and were closer to the K Low than to the K High line. The observation that hens within lines did not differ in respect to transmission of lysozyme concentration suggested that the third generation K High and both K Low progenies were genetically homogeneous and homozygous.

It has been concluded that there were definite genetic differences between the K High and K Low lines, that there was a definite influence of both sire and dam, and that nuclear, autosomal inheritance was involved. No conclusions were reached as to the presence or absence of dominance or the number of genes represented.

Second and third generation C-strain progenies were highly heterogeneous, and the difference between the two lines remained small. No attempt has been made to determine the underlying genetic mechanism, although similarity as well as heterozygosity of all C-strain sires has been suggested.

These genetic differences were not associated with the sodium and potassium concentration of egg white, or the level of tryptophan or vitamin A in the feed, and they could not be accounted for by changes in the total solids content of egg white.

Evidence has been obtained that lysozyme concentration is not related to egg production, body weight, hatchability, fertility, or mortality. Considerable evidence has been presented for a positive regression between lysozyme concentration and initial egg white quality, and some evidence has been presented for a negative regression between lysozyme concentration and decrease of egg white quality during storage. Sodium chloride has been shown to accelerate egg white thinning. The effect of lysozyme or univalent concentration on the rate of breakage of the lysozyme-ovomucin complex and the relation of this to egg white quality has been discussed. The biological significance of the genetic differences in lysozyme concentration and the reason for genetic heterogeneity in the stock studied has remained unclear. 121 pages. \$1.51. Mic 56-21

BOTANY

**THE VEGETATIVE ANATOMY OF  
THE GENUS SMILAX WITH  
PARTICULAR REFERENCE TO THE ENDODERMIS**

(Publication No. 14,403)

Fannie Mae Hurst, Ph.D.  
Purdue University, 1955

Major Professor: Arthur T. Guard

*Smilax Bona-nox* L., *S. hispida* Muhl., *S. lanceolata* L., *S. glauca* Walt., *S. rotundifolia* var. *quadrangularis* (Muhl.) Wood, *S. laurifolia* L., *S. pumila* Walt., *S. ecirrhata* (Engelm.) Wats., *S. herbacea* var. *lasioneura* (Hook.) A. DC., and *S. herbacea* L. in this anatomical investigation were found to have a continuous uniseriate endodermis throughout the root and shoot. The endodermis is evident

in longitudinal sections about 1/2 cm. from the stem tip and becomes more pronounced farther back. Differences in cell dimensions, and walls, and nuclei make the endodermis distinguishable before the formation of a Casparian strip. The term *proendodermis* is suggested for this stage of development. Casparian strips are vestigial and rarely discernable in the stem unless the protoplasts are plasmolyzed and adhere to them. Staining reactions and wall thickenings also help distinguish the endodermis from the cortex and pericycle. The endodermis is not always distinguishable in transverse sections of the above-ground portions of the shoot; it resembles cortex in *S. Bona-nox* and pericycle in the other species.

Some of the endodermal cells are easily distinguishable by a change in staining reaction and additional thickenings of the wall at ground level. More and more of these cells change until a short distance below ground all endodermal



cells are alike. Except in *S. lanceolata*, little correlation in the location of the greater thickened endodermal cells and the phloem in the below-ground stem is observed.

The continuity of the endodermal layer is retained in the stem as leaf and branch traces diverge. Endodermal cells differentiate to form a cylinder around the departing trace and to merge the layer centrad to the trace as it becomes discrete. During lateral root formation, the endodermal cells divide anticlinally and periclinally. The inner row thus formed maintains the continuity of the endodermal layer while the others form a portion of the lateral root primordium. The outer row surrounds the primordium until it emerges on the surface and is shed.

The maximum degree of wall thickening possible in the endodermal cells is least in *S. Bona-nox*, slightly more in *S. hispida* and greatest in the other species. These differences are correlated with the earlier reported origin and migrations of *Smilax* in which these two species and *S. rotundifolia* are reported from separate migrations.

The endodermis in the shoot of *Smilax* is considered a primitive feature and is discussed in relation to the taxonomy and phylogeny of the genus. Little correlation is found between environmental factors, other than edaphic, and extent of development of the endodermis.

The presence of an endodermis throughout all these species of the genus as well as maximum amount of wall thickenings possible in each is probably genetically controlled.

120 pages. \$1.50. Mic 56-22

#### THE EFFECT OF METABOLITES UPON CELLULAR DEVELOPMENT AND MORPHOLOGY IN CERTAIN CHLOROCOCCALES

(Publication No. 15,146)

Margaret Rosamond McMillan, Ph.D.  
Northwestern University, 1955

Chairman: L. H. Tiffany

Observations on paired strains of *Ankistrodesmus falcatus*, *Selenastrum* sp. and *Scenedesmus* spp. in a complete defined organic medium and its fractions revealed that all these forms were subject to continual morphological fluctuation which was independent of the medium. On four occasions populations of *Ankistrodesmus falcatus* shifted to a new, stably predominant type equivalent to a taxonomic variety different from the parent strain — this phenomenon may have been due to simultaneous or successive mutations for both morphological type and biochemical competence in a single cell or its progeny. Three clonal strains were isolated with the aid of the micromanipulator and proved to be fully as variable as mass populations of unknown origin, when grown under the same conditions.

One of these, *A. braunii* strain 245-St 1.1, was studied in detail, and the growth cycle and history of cellular development described. The rate of growth and length of lag phase were found to vary inversely with the size of the inoculum, but were the same in all media when the same initial concentration of cells was used. In mineral medium and glucose the negative acceleration phase breaks very sharply into the stationary phase at approximately  $1 \times 10^7$  cells/ml., while media containing organic nitrogen permit

a much more gradual deceleration and final populations up to six times as great as the simple media.

Cells of the stationary phase in mineral medium resemble younger cells in the complete medium, which contains a mixture of 19 amino acids, in many ways. All cultures are singularly homogeneous for species-type cells during the log phase, but begin to show variants at the beginning of the stationary phase; except that those in complete amino acid medium produce many variants throughout the entire growth cycle. All cultures are morphologically equivalent in the late stationary phase.

Periodic lysis of cells was observed in all media, following otherwise apparently normal cleavage. In the complete defined medium the majority of cells either fail to develop or lyse in the first division cycle; the apparently normal growth rate is due to liberation of abnormally large numbers of progeny from the few cells which are capable of survival. This evidence, along with observations by other workers of the effects of free amino acids on growth, cellular development and division in other microorganisms, indicates that some specific metabolites secreted by cells in an actively growing culture may cause inhibition of the normal patterns of growth and development of the cells and initiate the stationary phase.

Most of the morphological variants of this and related forms which were seen in the course of this study and are described in the literature may be ascribed simply either to mechanical forces which alter the shape of the cell or to persistence of cleavage patterns, exsporulation-shapes, formation of spores and the like. A few cells appear to begin the process of cytokinesis but are unable to complete it, resulting in branched or multispinous "monsters." Under optimal growing conditions nearly all cells in each of these categories are seen, in microcultures, either to regain normal shape and size during their own development or to produce normally shaped progeny in the course of the next division cycle. During the stationary phase and in amino acid medium the restitution of normal morphology often does not occur.

It is apparent from this study that only actively growing, young cultures, from which spores and aberrant cell types have been eliminated by frequent transfer in mineral medium, should serve as a valid basis for morphological and taxonomic studies. Normal developmental and sporulation stages of many Chlorococcales may resemble the "true forms" of unrelated species, genera and even families.

124 pages. \$1.55. Mic 56-23

#### KARYOTYPE ANALYSIS OF BEARDED IRIS

(Publication No. 15,028)

Jyotirmay Mitra, Ph.D.  
Cornell University, 1955

This investigation was concerned with a karyotype analysis of 40 species, geographical races and miscellaneous species hybrids of *Iris* belonging to the subgenera *Eupogoniris* and *Pogoniris*.

Various concepts of the karyotype and descriptive symbols used by different authors were discussed and a list of chromosome numbers in the genus *Iris*, including those determined during the present study, was assembled in tabular form.

A comparative karyotype analysis of *I. attica* ( $2n = 16$ ) and *I. pseudopumila* ( $2n = 16$ ), the two dwarf diploid species, with that of *I. pumila* ( $2n = 32$ ) indicated an amphidiploid origin of *I. pumila* from the two former species.

The karyotype of the 24-chromosome dwarf species, *I. mellita*, *I. reichenbachii*, *I. bosniaca* and *I. balkana* includes two pairs of median constricted "marker" chromosomes; in *I. balkana* the longer pair was slightly submedian. Four pairs of these median constricted marker chromosomes were found in the 48-chromosome dwarf species, *I. aphylla* and in the Chalkidiki dwarf. The tetraploid form of *I. balkana* includes three pairs of median and one pair of submedian constricted chromosomes.

In 24-chromosome tall species three different kinds of karyotypes were noted: *I. pallida* (Heinig) and diploid form of *I. kashmiriana* have two pairs of median constricted marker chromosomes; *I. pallida*, *I. illyrica*, *I. cengialti* and *I. imbricata* have only one pair of marker chromosomes; and *I. variegata*, *I. reginae* and *I. perrieri* have no median constricted chromosomes.

The 48-chromosome tall species, *I. kashmiriana*, *I. mesopotamica*, *I. cypriana*, *I. trojana* and *I. croatica* are characterized by having four pairs of median constricted chromosomes, twice the number of marker chromosomes present in *I. pallida* (Heinig) and the diploid *I. kashmiriana*. A detailed analysis of chromosomes of both the diploid and tetraploid *I. kashmiriana* indicated a possible autotetraploid origin of the tetraploid form. The occurrence of these two forms in the same region supported this conclusion.

The 40-chromosome dwarf species, *I. chamaeiridis*, *I. olbiensis*, *I. italica* and *I. benacensis* have in their somatic complement 16 chromosomes morphologically identical to those of *I. pseudopumila* and the remaining 24 chromosomes resemble those of *I. pallida*. An amphidiploid origin of these 40-chromosome species from a cross between 16-chromosome dwarf species like *I. pseudopumila* and 24-chromosome tall species such as *I. pallida* followed by doubling was indicated by the karyotype analyses.

Similarly, a hybrid origin of 44-chromosome intermediate bearded forms from 48-chromosome tall and 40-chromosome dwarf species was indicated from the studies of chromosome morphology.

Two distinct karyotypes were noted in the 22-chromosome *Regelia* section. *I. arenaria* and *I. flavissima* have two pairs of median constricted chromosomes whereas *I. korolkowii* has only one pair. The two 44-chromosome *Regelia* species, *I. stolonifera* and *I. hoogiana* have slightly different karyotypes.

The 20-chromosome *Oncocyclus* species *I. gatesii*, *I. susiana*, *I. lortettii* and *I. soforana* have exclusively chromosomes with subterminal centromeres.

From a study of the somatic chromosomes in various hybrids it was possible to identify the chromosomes of their respective parents.

Chromosomal heteromorphism and karyotype variation in geographic forms of *I. pseudopumila*, *I. mellita*, *I. pallida* and *I. variegata* were observed.

The presence of non-homologous chromosomes with extra segments attached to the short arm in some geographical forms of *I. pseudopumila* and *I. mellita* could have been due to either segmental interchange or heterobrachial inversion.

Among various groups of iris species a trend in karyotype specialization from a higher to a lower frequency of metacentric chromosomes culminated in the *Oncocyclus* section where there were no metacentric chromosomes.

179 pages. \$2.24. Mic 56-24

#### NEW NITROGENOUS CONSTITUENTS OF PLANTS: THEIR RECOGNITION, IDENTIFICATION AND METABOLIC ROLE

(Publication No. 15,422)

John Kingsley Pollard Jr., Ph.D.  
Cornell University, 1955

Certain new amino acids occurring in plants have been investigated. A comprehensive summary, in the form of tables, is included for all of the amino acids and certain of their derivatives which are now known to occur in plants. The metabolic relationships of these compounds are discussed in the light of modern knowledge of nitrogen fixation, group transfer reactions, and protein synthesis.

Seeking relationships among the newly discovered amino acids discloses the frequency with which these prove to be substances related to glutamic rather than aspartic acid, to be hydroxy, amino acids, or to be cyclic imino acids.

Among the substances related metabolically or structurally to glutamic acid, gamma-aminobutyric acid; gamma-methyleneglutamine; gamma-hydroxy, gamma-methylglutamic acid; and a partially identified ester of glutamine have all been isolated in crystalline form and identified by chemical methods. The metabolism of these compounds is discussed.

The synthesis, chromatographic characterization, and probable occurrence of gamma-guanidobutyric acid is discussed.

The effects of exogenous nitrogen supply on the accumulation of free amino acids by aerated potato tuber discs is reviewed with particular reference to the effects of urea.

Gamma-hydroxyvaline has been isolated for the first time from tumorous tissue of *Kalanchoe daigremontiana*, and characterized by chemical methods. Chromatographic methods showed the presence of alpha, gamma-diaminobutyric acid in the soluble nitrogen fraction of the potato tuber. Cadaverine was also a possible constituent of this extract.

An unidentified substance, shown to occur in several plants, was studied by chromatographic methods and shown to possess many of the properties of creatinine. Chromatographic evidence suggests that this material is responsible for reports of creatinine in plants.

The composition of the bulk proteins of tumorous tissue was determined and compared with that of normal tissue from the same plants. As in other work with plant tissue cultures, hydroxyproline seemed to have some special role in the proteins of rapidly growing tissue.

These discoveries are discussed from the standpoint of taxonomy, genetics, and physiologically, and their implications for future experiments indicated.

206 pages. \$2.58. Mic 56-25



## CHEMISTRY

### CHEMISTRY, ANALYTICAL

#### COULOMETRIC TITRATIONS

(Publication No. 13,684)

Robert Voorhees Dilts, Ph.D.  
Princeton University, 1954

Attempts were made to produce electrolytically several strong reducing agents that had not been investigated for coulometric titrations. It was found that tetravalent vanadium could be generated electrolytically from sodium metavanadate in 3.0 M sodium hydroxide. With this reagent it is possible to titrate at room temperature quantities of ferricyanide of 1.5 and 3.0 microequivalents with an average error of  $\pm 1.2$  per cent, using the sensitive amperometric end-point. The reaction is slow and careful control of the concentrations of vanadate ion and of the alkali is necessary in order to obtain 100 per cent current efficiency.

Trivalent molybdenum cannot be generated coulometrically at a gold or a platinum cathode in a sulfuric acid medium from either the sexi- or the quinquivalent ion.

An internal generation technique using cathodes of platinum, carbon, molybdenum, lead and gold did not lead to the attainment of 100 per cent current efficiency in the generation of divalent chromium. An external generation procedure employing a mercury cathode and using the reduction of ferric iron as a test titration gave only 75 per cent current efficiency under optimum conditions. Exclusion of oxygen, solution impurities, and the extreme reactivity of the chromous ion are believed to be the major difficulties.

The second portion of this work was devoted to the application of electrolytically generated ceric ion to the determination of various substances that had not been analyzed previously by the coulometric method. A cadmium amalgam reductor was effective in reducing uranyl ion to the quadrivalent state, which was then oxidized by excess ferric sulfate and ceric ions were generated electrolytically to oxidize the ferrous ions produced. The entire process was carried out in an atmosphere of nitrogen. The technique of reduction and coulometric titration gave results of good accuracy and precision in the range of from 5 micrograms to a few milligrams. Blanks were obtained in the microgram titrations that were equivalent to 1 microgram but they are fairly reproducible. Any substances that are reduced by the cadmium amalgam and reoxidized by ceric sulfate obviously interfere and must be removed.

The titration of sodium oxalate is so slow on a semi-micro scale at 50° C that it is not practical. Accurate results can be obtained if sufficient time is allowed for the reaction to occur completely, especially in the immediate vicinity of the equivalence point, but this results in a time of over an hour and a half to perform the titration. Because the solubility of cerous sulfate has a negative

temperature coefficient, concentrations of this salt great enough to give 100 per cent current efficiency at moderate currents cannot be achieved at temperatures much above 50° C. Various catalysts were investigated, but it was found that cobalt sulfate, osmium tetroxide, and manganese sulfate had no effect. A combination of phosphoric acid and manganese sulfate was finally used but even this was not completely satisfactory.

Samples of potassium ferrocyanide from 1.7 to 62 microequivalents have been titrated with electrolytically generated ceric ion with an accuracy of  $\pm 0.40$  per cent or better.

Titanium was reduced in a Jones reductor, caught in a saturated cerous sulfate solution and titrated coulometrically with ceric ion under an atmosphere of nitrogen. Using the sensitive amperometric end-point it was possible to determine amounts of this ion ranging from 50 micrograms to 5 milligrams with an accuracy of  $\pm 0.6$  per cent. Larger samples cannot be determined readily because of the insolubility of titanium sulfate.

Mixtures of iron and titanium containing amounts of titanium from 0.013 to 0.16 milliequivalents and amounts of iron of 0.06 to 0.12 milliequivalents can be determined with an accuracy of 0.66 per cent or better. The titanium can be determined with an accuracy of  $\pm 0.6$  per cent or better and the iron within 0.80 per cent. The mixture was passed through a Jones reductor and caught in a solution containing at least 90 per cent of that amount of ceric ion calculated to be required for the titration of the titanium in the sample. The entire process is carried out under an atmosphere of nitrogen. This procedure necessitates a rough prior knowledge of the amount of titanium present in the sample, but if the ceric sulfate was not present initially, results were in error for the titanium by as much as 20 per cent.

112 pages. \$1.40. Mic 56-26

### CHEMISTRY, BIOLOGICAL

#### BIOCHEMICAL STUDIES ON THE GOLDEN NEMATODE (*HETERODERA* *ROSTOCHIENSIS* WOLLENWEBER) HATCHING FACTOR

(Publication No. 9744)

Robert Victor Dahlstrom, Ph.D.  
Cornell University, 1954

#### I. Introduction

The golden nematode or potato eelworm requires the potato plant or tomato plant as a specific host. The worm invades the roots of the plant causing a disease described as potato sickness. Larvae of the nematode are carried



over the winter in a cyst form and stimulated to hatch by secretions of the actively growing potato or tomato roots.

The exact nature of this hatching factor has not been determined. The chemical evidence available (Todd et al., Biochem. J. 45, 513(1949)) indicated that the compound was phenolic or enolic, contained one or two hydroxyl groups and two or three active hydrogens per molecule with a molecular weight somewhere between 200 and 300. In 80% aqueous phenol the compound has an  $R_f$  value of 0.87.

Previous methods of assay have involved counting the number of larvae hatched when a known weight of cyst material was exposed to solutions containing different concentrations of the factor. The method is tedious and subject to a number of errors so it was desirable to find another organism, preferably a microbe, that would respond to the factor.

Fungi have found a very important place in the list of microorganisms available for use as analytical tools ever since Pasteur used *P. glaucum* for selectively assimilating d-tartaric acid from a racemic mixture permitting the isolation of the unchanged unnatural l-tartaric acid. The fungi have been used in the quantitative determinations of heavy metals, vitamins, amino acids and purines. Mutants of various fungi have found an important place in bioassay work.

## II. Isolation and Identification of *Aspergillus awamori* Nakazawa

Isolation of microorganisms from the soil surrounding actively growing tomato plants revealed a fungus of the genus *Aspergillus* that responded to added concentrates of the hatching factor. Identification of the fungus proved it to be *Aspergillus awamori* Nakazawa. Manifestation of the response to the hatching compound could be measured by mold pad weight increase and by acid increase on a medium containing glucose, salts, yeast, peptone and sodium acetate.

## III. Mold Response to the Golden Nematode Hatching Factor

The assay was prepared using 125 ml. Erlenmeyer flasks. Twenty-five milliliters of single strength medium were added, the flasks loosely stoppered with cotton plugs and autoclaved 15 minutes at 120°C. After cooling, a sterile solution of the factor was added and the medium inoculated with two drops of a standard spore suspension. The flasks were incubated for 6 days at 25°C. and mold pad weight or acid production measured. The standard solution of GNHF contained 1 mg./ml. of solid matter and dilution of this material ranged from 5 mg./30 ml. out to  $5 \times 10^{-6}$  mg./30 ml.

A study of the conditions influencing the response showed that temperature and time of incubation, pH of medium, buffer used, nitrogen and carbon source, mineral elements and several inhibitors exerted a marked influence on the acid production of the fungus and response to the factor. From these observations the conditions established were glucose as a carbon source, yeast and peptone as nitrogen sources, sodium acetate pH 5.5 as a buffer, and incubation at 25°C. for 6 days. The factor was shown to overcome the inhibition of fluoroacetate added to replacement and spore cultures. Manganese at

concentrations of 0.1 and 0.2 mg./ml. and zinc at 0.001 mg./ml. stimulated acid production in the fungus.

Chromatography of the factor on paper with 80% aqueous phenol as the mobile phase and measurement of the increase in acid production to segments of the strip gave an  $R_f$  value of 0.87. This value corresponds to that obtained using the golden nematode as the assay organism.

## IV. Stimulation of Glucose Oxidation by *Aspergillus awamori* Nakazawa

Pregrown mold pads were homogenized thoroughly and centrifuged for 10 minutes at 22,000 x g. The residue was washed twice, homogenizing each time and resuspended in phosphate buffer after the second centrifugation. This preparation was used to measure the stimulation in glucose oxidation by added nematode hatching factor.

Respiration would not occur unless a 10% boiled yeast solution was added to the flasks. A flavin nucleotide preparation from *E. ashbyii* was also stimulatory. Only in the presence of the boiled yeast or the *E. ashbyii* extract was the factor stimulatory. With the flavin nucleotide preparation, DPN also increased oxygen uptake and the factor further stimulated oxygen consumption when added to DPN and the *E. ashbyii* extract. DPN was not stimulatory in the presence of yeast. TPN had no effect when added to either the *E. ashbyii* extract or boiled yeast. Other known-co-factors were added but none of them could replace the yeast and/or factor. In the presence of yeast the spore oxidation of glucose was roughly linear to levels of the factor between 30 ug. and 150 ug. of factor per flask.

Sodium azide and hydroxylamine inhibited oxidation 100% while potassium cyanide inhibited about 30%. Iodoacetate, fluoroacetate, p-chloromercuribenzoate and sodium fluoride were without effect. This suggested a direct oxidative route of glucose that was dependent on metallo enzymes as electron carriers. Chromatography of the oxidation products of glucose revealed only gluconic acid which strengthened the direct oxidative route.

Substrates added as possible intermediates were not oxidized by the spores. This, however, may have been a lack of permeability as whole spores were used.

Preliminary yeast fractionations showed the most active preparation was in the precipitate obtained when the supernatant from the 30% acetone precipitable fraction was brought to 40% acetone.

## V. Stimulation of Glucose Oxidation by *Pseudomonas aeruginosa* ATCC 9027

Cells of *Pseudomonas aeruginosa* oxidizing glucose were stimulated by addition of the GNHF, whereas those oxidizing gluconic acid were not. Glucose-6-phosphate was not oxidized by the intact cells.

Cell-free juices oxidized glucose and gluconic acid rapidly and glucose-6-phosphate slowly. The presence of the hatching compound did not stimulate oxygen uptake suggesting that either the factor was undergoing a change in the whole cells or that stimulation was on the oxidation of glucose-6-phosphate.

A comparison of glucose oxidation by whole cells respiring in Tris buffer and phosphate buffer showed that the rate of oxygen consumption and total oxygen uptake was the same using the two buffers. The addition of 120 ug. of GNHF to cells in phosphate buffer increased oxidation by

30% but this same amount added to cells in Tris buffer had no effect. From this it appeared that phosphorylation of the factor was necessary before it stimulated glucose oxidation. 109 pages. \$1.36. Mic 56-27

**A STUDY OF THE BIOGENESIS OF LONG-CHAIN  
FATTY ACIDS IN A HIGHER PLANT  
(FLAX, *Linum usitatissimum* L.)**

(Publication No. 13,964)

Walter Paul Gible, Jr., Ph.D.  
University of Arizona, 1956

An *in vitro* culture system was developed in which an acetate substrate was utilized by immature flax fruits for the synthesis of long-chain fatty acids. By means of this system, radioactive long-chain fatty acids were obtained when C-14 carboxyl-labeled acetate was added to the culture medium. After extraction of the radioactive fatty acids, the saturated acids and oleic, linoleic, and linolenic acid were separated from the fatty acid mixture by low-temperature crystallization. Each acid was then degraded one carbon at a time, and the specific activity of each degraded carbon was determined. The results show that the odd-numbered carbon atoms of the fatty acids are highly radioactive, whereas the even-numbered carbon atoms are of very low specific activity. This confirms the multiple condensation theory of long-chain fatty acid synthesis in a higher plant. Results show further that the individual fatty acids investigated were all synthesized by essentially the same mechanism. 34 pages. \$1.00. Mic 56-28

**KINETIC STUDIES ON THE NUCLEIC ACIDS  
OF REGENERATING MOUSE LIVER**

(Publication No. 14,526)

Christine D. Jardetzky, Ph.D.  
University of Minnesota, 1955

The method of partial hepatectomy was standardized on mice, and the growth rates of the liver were determined at different regeneration stages. From studies on the mitotic index as well as the absolute increase in the amount of DNA per liver, it was observed that the growth rate of the liver was close to zero up to 30 hours, that it reached a maximum value between 36 and 42 hours, and that it slowly decreased up to 3 days after the operation. 3 to 4 weeks after partial hepatectomy the livers had reached the pre-operative weight. Most of the liver restoration, however, was complete by 1 week.

The composition of regenerating liver at 60 hours was studied. The amounts of total acid, soluble and inorganic phosphorus, nucleic acids, phospholipids, and protein-phosphorus per gram of fresh liver from different cell fractions isolated by differential centrifugation, were determined and the nuclear and mitochondrial fractions were corrected for yield.

In the experiments with radiophosphorus, some aspects of the purification methods were evaluated.

A study of the DNA relative specific activity at different regeneration stages revealed that it can be used as an index of the growth rate of this tissue.

The kinetic study was carried out during the 58 to 64 hour regeneration period because of the relatively constant growth rate of the liver during the 54 to 72 hour interval. Four metabolically distinct RNA's were isolated, of which the nuclear RNA had the highest specific activity time curve. The other 3 were the microsomal, ultramicrosomal, and supernatant RNAs, all of which were derived from the cytoplasm. The ultramicrosomal RNA could be considered to be approximately a 50-50 mixture of the supernatant and microsomal RNAs. The specific activity time curves of inorganic phosphorus and DNA were also studied.

The phospholipids from all the cell fractions were found to have almost identical specific activities at all times. In the case of the protein-phosphorus, the nuclear fraction showed a lower specific activity time curve than all the other fractions. All phospholipid and protein fractions had specific activities of the order of the NRNA specific activity at any time during the kinetic study.

For the mathematical analysis of the kinetic study, the theoretical equations were developed and the assumptions in their application were discussed. Several metabolic schemes were tested for compatibility with the experimental data. Although none of the schemes tested were found to fit perfectly, the experimental data, the limiting values of the fractional rates of reactions leading to any one of the nucleic acids were obtained from some of the schemes. 118 pages. \$1.48. Mic 56-29

**KINETICS OF MUTAROTATION OF ALDOSES  
IN THE PRESENCE OF METALLIC IONS**

(Publication No. 14,287)

Wesley Brock Neely, Ph.D.  
Michigan State University, 1953

The mutarotation of aldoses in salt solutions was investigated and catalysis by lithium, beryllium, magnesium, calcium, cupric and ferric ions was observed. Catalytic constants were determined for each of these species.

Addition of the aforementioned ions to acetate buffers caused diminution of the observed rate constant at lower concentrations, whereas at higher concentration augmentation of the constant occurred. This phenomenon is explained by assuming that the acetates of these ions are incompletely dissociated. On this basis it is possible to treat the lithium acetate system mathematically. Two different mathematical analyses, A and B were applied. In A it was assumed that the reaction is bimolecular throughout. In B termolecular processes were allowed. Although neither the expression derived in A nor that in B permitted exact agreement with the observed rate constants, better values for these constants were obtained in the latter analysis.

From the observation that third order kinetics may be applied to the metal ion catalysis of mutarotation, a mechanism is presented in which a concerted attack by the metal ion and the nucleophilic reagent appear in the rate determining step. 47 pages. \$1.00. Mic 56-30



## AN OXIDATION PRODUCT OF STILBESTROL

(Publication No. 15,310)

Frank Daniel Vasington, Ph.D.  
University of Maryland, 1955

Supervisor: Raymond E. Vanderlinde

From alkaline inactivated stilbestrol solutions Vanderlinde isolated four compounds, one of which was a non-estrogenic compound, called the 157° acetate, which stimulated the release of pituitary adrenotropic and gonadotropic hormones.<sup>1,2</sup> This compound is of interest because a non-estrogenic compound which showed pituitary gonadotropic releasing properties might potentially be of clinical use in female sterility.<sup>3</sup>

This study has shown that the 157° acetate, a  $C_{20}H_{18}O_7$  compound, is the diacetate of a  $C_{18}H_{14}O_5$  compound, m.p. 249-251°C. The tentative structures,  $\alpha$ -acetyl-4,4'-diacetoxybenzoin and  $\alpha$ -acetyl-4,4'-dihydroxybenzoin, have been proposed for the 157° acetate and its free phenol, respectively. The 157° acetate has an absorption maximum at 248.5 m $\mu$  with a molecular extinction coefficient of 39,400. The infrared spectrum shows the presence of an ester carbonyl, possible an aliphatic carbonyl and an aryl carbonyl. A logical scheme has been proposed for the formation of this compound from alkaline oxidized stilbestrol.

Since chemical degradation studies on this compound were not feasible, due to the very limited amounts of material available, proof of structure by synthesis was attempted. However, attempts to synthesize  $\alpha$ -acetyl-4,4'-diacetoxybenzoin have been unsuccessful and, therefore, the structure of the 157° acetate remains in doubt.

The biological aspect of this problem was to develop improved methods utilizing non-littermate rats for the demonstration of biological activity by the 157° acetate.

In a pituitary gonadotropic assay in which the response to a test pituitary preparation was compared in intact and hypophysectomized immature male rats, the latter was shown to be definitely superior. This experiment also demonstrated that one donor pituitary was adequate to produce a significant effect even in non-littermate recipients. However, when this assay method was used to analyze the pituitaries of non-littermate mature male rats treated with the 157° acetate, stilbestrol and the monomethylether of stilbestrol, no significant changes in pituitary gonadotropic potency could be demonstrated. Further, unlike stilbestrol and the monomethylether of stilbestrol, no significant changes in pituitary gonadotropic activity could be demonstrated by directly weighing the accessory male reproductive tissues of the donor mature male rats treated with the 157° acetate. It appears, therefore, that this procedure cannot be used as an adequate pituitary release assay test. Also, no effect on organ weights was observed in immature females treated with the 157° acetate for seven days. It also failed to cause a premature opening of the vaginas of immature female rats. However, a study of the 157 acetate solution administered showed that it was not stable. This possibility accounts for the negative results obtained in these experiments. 68 pages. \$1.00. Mic 56-31

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AN IN VITRO STUDY OF THE TYPE OF  
FERMENTATION EXHIBITED BY RUMEN  
MICROORGANISMS ON HIGH-NITROGEN SUBSTRATES

(Publication No. 13,965)

James Harold Ware, Ph.D.  
University of Arizona, 1956

Samples containing cellulose as the sole source of carbohydrate and graded levels of either urea, zein or cottonseed meal as the sole source of nitrogen were incubated with strained rumen fluid for 24 hours at 38° C. in a dialyzing miniature artificial rumen in an attempt to clarify the nature of the maladies which occur in ruminants with unusually high nitrogen intakes.

Residual cellulose was determined on all samples following fermentation, and volatile fatty acids were isolated from the dialysis medium, separated and measured. Cellulolytic activity increased with all nitrogen sources up to the 20 percent protein level and decreased sharply above this point with urea and cottonseed meal but to a lesser degree with zein. As the nitrogen content increased samples containing urea produced primarily acetic and butyric acids, and those with cottonseed meal produced chiefly acetic acid.

It was concluded that high nitrogen levels inhibited cellulolytic activity and that zein and cottonseed meal stimulated the production of larger amounts of the ketogenic acetates and butyrates, while urea caused the production of larger amounts of the glycogenic propionates.

44 pages. \$1.00. Mic 56-32

## CHEMISTRY, INORGANIC

THE APPLICATION OF SPOT TEST TECHNIQUES  
TO FLUOROMETRIC ANALYSIS

(Publication No. 15,315)

Joseph Roy Wiebush, Ph.D.  
University of Maryland, 1955

Supervisor: Professor Charles E. White

Fluorometric reagents suitable for spot tests on paper have been found for eight elements. These elements with the reagents indicated in parentheses are as follows: aluminum (Acid Alizarin Garnet R, Color Index 168), gallium (Eriochrome Red B, Color Index 652), gallium (8-hydroxyquinaldine), zirconium (quercetin), tin (quercetin), fluoride (zirconium-quercetin complex), fluoride (aluminum-Acid Alizarin Garnet R complex), zinc (8-hydroxyquinaldine), boron (benzoin), boron (quercetin), and germanium (sali-cylidene-o-aminophenol). The reagents are highly selective and sensitivity in most cases is in the range of one

microgram per 0.01 ml. drop. Salicylidene-o-aminophenol and 8-hydroxyquinaldine are new reagents for fluorometric analysis.

Fluorescence and excitation spectra were determined for most of the metal chelates indicated above. The excitation wavelengths for the maximum fluorescence of these compounds range from the short ultraviolet to the green region of the spectrum.

Instrumentation was arranged for the measurement of excitation and fluorescence spectra of compounds on paper. Both the Bausch and Lomb Grating Monochromator and the Beckman DU Spectrophotometer were used in conjunction with a microphotometer for these purposes.

The emission spectra of seven available ultraviolet excitation sources were determined. The xenon lamp was the most continuous source of intense ultraviolet light, with little variation in intensity over the range from 3000 to 6000 Å.

The high pressure mercury vapor lamp with a maximum emission wavelength of 3650 Å is the most practical intense source of excitation for the fluorescence of metal chelates. The difference in magnitude of fluorescence excited at the optimum wavelength and that at 3650 Å is more than offset by the high intensity of the mercury vapor lamp.

A fluorometric determination of gallium with Eriochrome Red B as the reagent in the presence of aluminum has been devised. Both aluminum and gallium form fluorescent chelates with Eriochrome Red B at pH 4, but at pH 2, only the gallium chelate forms. In 2.5 N acetic acid solution the reagent produces a fluorescence with gallium but not with aluminum. 111 pages. \$1.39. Mic 56-33

hydrolysis produced nearly quantitative yields of glyoxal, identified as the p-nitrophenylosazone, m.p. 306°. The isolation of dioxadiene when the material, m.p. 55-56°, was treated with magnesium iodide and magnesium in n-butyl ether, was further proof of the symmetrical arrangement of the chlorine atoms.

This isomer of 2,3,5,6-tetrachloro-p-dioxane, m.p. 55-56°, was shown to be a new chemical entity by a comparison of the infrared spectrum with those of the known symmetrical tetrachloro-p-dioxanes, m.p. 143°, m.p. 101°, m.p. 70°, and m.p. 60°. All five isomers gave quantitative yields of glyoxal p-nitrophenylosazone when hydrolyzed in water and treated with p-nitrophenylhydrazine. The rates of hydrolysis of the five isomers were studied and it was found that all followed first order kinetics but with different rate constants, again indicating five distinct compounds. Final indication that the symmetrical tetrachloro-p-dioxane reported herein is in fact a new isomer was obtained by making mixed melting points with all known isomers: depressed melting points were observed in all instances. This work completes the series of the five isomers of 2,3,5,6-tetrachloro-p-dioxane, all that can be predicted using the classical concept of structure.

By analogies with the chlorinated cyclohexanes, whose structures have been established by x-ray analysis and ease of dehydrohalogenation, and with vicinal dihalo steroids in which the configurations of the halogen atoms are known, some speculative assignments of stereochemical conformations based on the new concept of axial-equatorial bonds have been given to the five isomers of 2,3,5,6-tetrachloro-p-dioxane. These assignments were based on the complexities of the infrared spectra, melting points, rates of hydrolysis, methods of preparation, conversions of one isomer into another, and the reaction with potassium iodide in acetone. 133 pages. \$1.66. Mic 56-34

## CHEMISTRY, ORGANIC

### A NEW ISOMER OF 2,3,5,6-TETRACHLORO-p-DIOXANE

(Publication No. 15,124)

Milton Cooper, Ph.D.  
Northwestern University, 1955

Bryan showed that symmetrical tetrachloro-p-dioxane, m.p. 101°, when heated to 180°, either alone or with calcium oxide, yielded a new compound, m.p. 49-50°, of the same composition and molecular weight as the starting material. Since the new compound did not give a significant yield of glyoxal when hydrolyzed in a sealed tube, it was tentatively assigned the structure of either 2,2,5,5- or 2,2,6,6-tetrachloro-p-dioxane. (L. A. Bryan, Ph.D. Dissertation, Northwestern University, 1944.) The same compound was prepared in the present work by techniques similar to those of Bryan's as well as by refluxing either 2,3,5,6-tetrachloro-p-dioxane, m.p. 101°, or 2,3,5,6-tetrachloro-p-dioxane, m.p. 143°, with thionyl chloride. Repeated purification of the product by crystallization, sublimation, or chromatography indicated a revised melting point of 55-56°.

The chlorine atoms were shown to be in the 2,3,5,6 positions when it was determined that mild but continued

## STUDIES OF SOME PYRIDINE 1-OXIDES

(Publication No. 15,194)

Aldo Joseph Croveti, Jr., Ph.D.  
University of Illinois, 1955

The conversion of pyridine to pyridine 1-oxide brings about a remarkable change in the reactivity of the nucleus. Not only is attack by electrophilic agents greatly facilitated but also attack by nucleophilic agents is greatly enhanced. Thus pyridine 1-oxide displays an amphoteric nature towards these agents. The interesting fact is that both types of attack occur at the 2- and 4-positions.

Although pyridine 1-oxide has been known for some time, (1) it has not been until recent years that its versatility as an intermediate has been appreciated. As a result of these recent efforts, largely by Japanese workers (2) and by Hertog, (3-10) it has been amply demonstrated that pyridine and pyridine derivatives containing the N-oxide function are highly reactive and useful compounds. This thesis reports on the utilization of nicotinic acid 1-oxide, nicotinamide 1-oxide and their derivatives and 3-methylpyridine 1-oxide as synthetic intermediates for the preparation of various pyridine derivatives and condensed pyridine systems.



## DISCUSSION OF RESULTS

Nicotinamide 1-oxide, formed by the peracid oxidation of nicotinamide, when treated with phosphorus pentachloride and phosphorus oxychloride has been conveniently converted to 2-chloronicotinonitrile. Ammonolysis of the latter with ethanolic or anhydrous ammonia yielded the hitherto unknown 2-aminonicotinonitrile. Via 2-chloro- and 2-aminonicotinonitrile, nicotinamide 1-oxide has served as a useful synthetic intermediate for the preparation of 2-aminonicotinic acid, 2-aminonicotinamide, 2-chloronicotinamide and 2-hydroxynicotinic acid. Other simple and new pyridine derivatives derived from nicotinamide 1-oxide via 2-chloronicotinonitrile are 2-mercapto-2-methoxy-, 2-anilino-, 2-(p-nitrophenoxy)nicotinonitrile and 2-methoxynicotinamide.

Nicotinic acid 1-oxide, although not as versatile an intermediate as nicotinamide 1-oxide, has been used in convenient syntheses of 2-chloronicotinic acid, 2-chloronicotinamide and 2-mercaptonicotinic acid.

Reaction of 2-chloronicotinonitrile with hydrazine gave the new 3-amino-1-pyrazolo (3,4-b) pyridine. This reaction represents a new method of synthesis of this condensed pyridine system.

2-[3-(2-Aminopyridyl)]-4-aminopyrido (2,3-d) pyrimidine has been identified as the product formed in the reaction of 2-chloronicotinonitrile with anhydrous ammonia at high temperatures (185-200°) and also by the self-condensation of 2-aminonicotinonitrile under various conditions. 2-[3-(2-Aminopyridyl)]-4-hydroxy- and 2-[3-(2-hydroxypyridyl)]-4-hydroxypyrido (2,3-d) pyrimidine have been identified as the products formed when the corresponding diamino compound was heated with concentrated hydrochloric acid or nitrous acid in sulfuric acid respectively. 2-Hydroxy-4-amino (2,3-d) pyrimidine has been prepared from 2-chloronicotinonitrile or 2-aminonicotinonitrile by condensation with urea. By this new method of synthesis of the pyrido (2,3-d) pyrimidine system, 2-mercapto-4-amino (2,3-d) pyrimidine and 2,4-diaminopyrido (2,3-d) pyrimidine were synthesized although in low yield, by condensing 2-aminonicotinonitrile with urea and guanidine respectively.

A convenient and improved synthesis of 4-aminonicotinic acid was developed from 4-nitro-3-picoline 1-oxide via 4-amino-3-picoline. Oxidation of 4-nitro-3-picoline 1-oxide gave 4-nitronicotinic acid 1-oxide. The latter served as an essential intermediate, via 4-methoxynicotinic acid 1-oxide and 4-methoxynicotinamide 1-oxide in a simple and direct synthesis of the castorbean alkaloid ricinine.

In connection with the synthesis of ricinine, a ricinine analog, N-methyl-3-cyano-4-methoxy-6-pyridone was prepared from ethyl 4,6-dihydroxypyridine-3-carboxylate and 4,6-dichloronicotinonitrile.

The action of an alcoholic alkaline solution in the presence of n-butyl nitrite or the action of an aqueous alkaline solution on 4-nitro-3-picoline 1-oxide led to a product identified as N,N'-dioxy-4,4'-dinitro-3,3'-dipicolyl. This activity of the 3-methylpyridine group towards an alkaline medium was also exemplified by the fact that 4-nitro-3-picoline 1-oxide condensed with aromatic aldehydes in the presence of piperidine either in absolute ethanol or pyridine solutions. The products formed represented a new class of 3-stilbazoles. Pharmacological testing showed

these derivatives to possess high *in vitro* antibacterial activity. 164 pages. \$2.05. Mic 56-35

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THE HEATS OF COMBUSTION  
OF SOME AMIDES AND AMINES

(Publication No. 15,400)

William Charles Dzombak, Ph.D.  
Purdue University, 1950

Major Professor: Dr. Herschel Hunt

The heats of combustion have been evaluated for some organic compounds which contain nitrogen. The apparatus and the experimental procedure employed for these measurements have been described in previous communications<sup>1,2,3</sup> from this laboratory. Using the ordinary, non-adiabatic method of calorimetry, the heat of combustion has been determined for each of the following compounds: pentanamide, hexanamide, octanamide, salicylaldehyde, n-propyl carbamate, 2,6-diaminopyridine, p-dimethylaminobenzaldehyde, 3-hydroxy-2-naphthoic acid, 3-N-phenylamino-2-naphthoic acid and 4,7-diketo-5,6-diazadecanedioic acid.

The energy equivalent of the calorimeter was determined with benzoic acid, Standard Sample 39g, obtained from the National Bureau of Standards. Cylindrical pellets of all of the compounds were formed. In some cases, a wafer of benzoic acid was placed above the pellet, in order to promote ignition, or below the pellet, in order to prevent the formation of the slight deposit of carbon often found in the ignition cup before this measure was taken. The weights of the pellets were adjusted so that the amount of heat liberated was comparable to that liberated by the burning of the 1.075 ± 0.02 gram of benzoic acid employed for each calibration experiment. Stainless steel crucibles, pre-ignited to provide a clean and reproducible surface, were employed to contain the pellets. The Parr double-value oxygen bomb used has a volume of 0.358 liters. The

ignition cup and 1.1 ml. of water were placed in the bomb, and the bomb was filled with oxygen to a pressure of 30 atmospheres, absolute, at 25°C.

Temperature measurements were made with two nine-junction copper-constantan thermels and a White double potentiometer. These observations were made, during the 60-minute test period, at 1-minute intervals sounded by a timer<sup>3</sup> modified by Kibler<sup>4</sup> to operate from the beam of light reflected from a mirror mounted on the shaft of a synchronous electric motor.

The energy liberated by the ignition of the fuse wire was evaluated in the manner previously described.<sup>2</sup>

Details concerning the treatment of the experimental data have been presented in other publications.<sup>1,2</sup> The weights of all of the samples were corrected to vacuum.

| COMPOUND                             | HEAT OF COMBUSTION |
|--------------------------------------|--------------------|
|                                      | kg.-cal./mole      |
| Pentanamide                          | 754.56 ± 0.25      |
| Hexanamide                           | 905.83 ± 0.18      |
| Octanamide                           | 1218.5 ± 0.2       |
| Salicylaldehyde                      | 854.03 ± 0.16      |
| n-Propyl carbamate                   | 551.41 ± 0.10      |
| 4,7-Diketo-5,6-diazadecanedioic acid | 846.01 ± 0.49      |
| 2,6-Diaminopyridine                  | 708.10 ± 0.11      |
| 3-Hydroxy-2-naphthoic acid           | 1177.6 ± 0.2       |
| 3-N-phenylamino-2-naphthoic acid     | 1980.4 ± 0.5       |
| p-Dimethylamino-benzaldehyde         | 1189.0 ± 0.2       |

The values for the heats of combustion listed are to be referred to the process which occurs at constant volume and at 25°C to produce gaseous carbon dioxide, gaseous nitrogen and liquid water.

The standard deviation of each value has been reported as recommended<sup>5</sup> by Rossini and Deming.

77 pages. \$1.00. Mic 56-36

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# THE KINETICS OF THE ADDITION OF BROMINE AND QUATERNARY AMMONIUM TRIBROMIDES TO $\alpha,\beta$ -UNSATURATED ACIDS IN NON-POLAR SOLVENTS

(Publication No. 14,113)

Leland Harris, Ph.D.  
State University of Iowa, 1955

Chairman: Professor R. E. Buckles

The kinetics of the addition of bromine in the dark to crotonic acid, tiglic acid, and  $\beta,\beta$ -dimethylacrylic acid were investigated in ethylene chloride and in carbon tetrachloride at 30°. It was possible to calculate reasonably reproducible second order rate constants for the reaction of tiglic acid with bromine in ethylene chloride and approximate constants of reproducible order of magnitude for crotonic acid and  $\beta,\beta$ -dimethylacrylic acid in both solvents. In some cases, evolution of hydrogen bromide from the reaction mixture catalyzed bromine addition to a great extent. An induction period was observed in several of the reactions. No surface effect of glass beads was observed in reactions of tiglic acid with bromine in ethylene chloride. In general, the addition of bromine to  $\alpha,\beta$ -unsaturated acids was faster and less erratic in ethylene chloride than in carbon tetrachloride. In either solvent  $\beta,\beta$ -dimethylacrylic acid reacted faster than tiglic acid which, in turn, reacted faster than crotonic acid. Spectrophotometric measurements of solutions of bromine and hydrogen bromide in dry carbon tetrachloride and in carbon tetrachloride saturated with water showed that no tribromide ion was present. The mechanism of bromination of substituted acrylic acids in uncatalyzed reactions and reactions catalyzed with hydrogen bromide has been discussed. It appears to involve initial bromine-olefin complexing.

The kinetic results for the addition reaction of a quaternary ammonium tribromide with crotonic acid in ethylene chloride, which were obtained in the present investigation and also in an earlier investigation (R. E. Buckles and J. P. Yuk, J. Am. Chem. Soc., 75, 5049 (1953)), can best be explained by a combination of three reactions. This combination is summarized in the overall rate law in which E represents crotonic acid.

$$-\frac{d(E)}{dt} = k_2(E)(Br_3^-)(Br_2) + k_3(E)(Br_3^-) + k_4(E)(Br_3^-)(Br^-)$$

When mixtures of bromine and tribromide ion reacted with crotonic acid the first term predominated in the rate law. When tetrabutylammonium tribromide alone reacted with crotonic acid the second term of the rate law was predominant during the early stages of the reaction, but the third term became important as the reaction progressed. With tetrabutylammonium bromide added initially the third term of the rate law became still more important. This catalytic effect of bromide ion was diminished by the presence of a large excess of the salt, however. A similar but less extensive catalysis by nitrate ion was also observed. When tetramethylammonium tribromide in the absence of added bromine reacted with crotonic acid the concentration of the bromide ion was kept at a low, constant value by the relatively low solubility of tetramethylammonium bromide in ethylene chloride. This situation caused the first term of the rate law to become important along with the second while the effect of the third was negligible.

109 pages. \$1.36. Mic 56-37



## THE ADDITION OF THIOLACETIC ACID TO OLEFINS

(Publication No. 15,134)

William Ainslie Hewett, Ph.D.  
Northwestern University, 1955

Thiolacetic acid has been known to add anti-Markownikoff to olefins since 1938. In the course of this investigation the orientation and the stereospecificity of the addition were rigorously investigated. In addition, the following points were also studied: (1) the value of thiolacetic acid as a synthetic tool, (2) the possibility of free radical rearrangements taking place during the addition of thiolacetic acid to systems prone to rearrange, and (3) the pyrolysis of thioesters.

In studying the above points, the anti-Markownikoff addition of thiolacetic acid has been carried out in uniformly high yields under light initiation to 2-methyl-1-butene, 2-methyl-1-pentene, 2-methyl-2-pentene, 4-methyl-1-pentene, 1-methylcyclopentene, 1-methylcyclohexene, cyclohexene,  $\alpha$ -methylstyrene, 2-pentene, 4-methyl-2-pentene, methallyl chloride, 2-chloro-2-propene, 5-chloro-1-pentene, camphene,  $\alpha$ -pinene and  $\beta$ -pinene.

The orientation of the addition of thiolacetic acid to olefins has been demonstrated to be at least 100/1 anti-Markownikoff. In the case of unsymmetrical olefins,  $RHC=CHR'$ , neither alkyl directive influences nor steric considerations seem to play an important role in the examples studied.

It has been demonstrated that the addition of thiolacetic acid is not stereospecific *trans*-, rather it adds preferentially *trans*-, but this is accompanied by some *cis*-addition. The mechanism of the addition has been discussed in light of this and other evidence from free radical addition reactions.

A novel synthesis of cyclic sulfides in excellent yields has been developed in a two step procedure starting with a haloalkene and thiolacetic acid. In addition to cyclic sulfides, the value of thiolacetic acid as a synthetic tool has been demonstrated in the preparation of thioesters, thiols, and sulfonyl chlorides from olefins in excellent over-all yields.

An investigation of the possibility of free radical rearrangements taking place during the addition of thiolacetic acid to three terpenes led to evidence that rearrangement does not accompany the addition as it does in the case of the additions of carbon tetrachloride to  $\beta$ -pinene.

A preliminary investigation of the products of the pyrolysis of *cis*-2-methylcyclopentyl thiolacetate has shown that the elimination is predominantly in a *cis*-manner as is in the case of xanthates, acetates and benzoates.

132 pages. \$1.65. Mic 56-38

## CYCLIC SULFONES. SEVEN MEMBERED RINGS.

(Publication No. 15,084)

Arthur Katchman, Ph.D.  
Polytechnic Institute of Brooklyn, 1956

The synthesis of thiaepin-1,1-dioxide was of interest because it represents a case in which the postulate of Huckel, i.e., the  $(2+4N)\pi$  electrons are associated with

physical stability in cyclic conjugated planar molecules, could be examined for a sulfur system. The lower membered rings in a cyclic sulfone series are inapplicable since thiophene-1,1-dioxide is unstable and thiapyran-1,1-dioxide would contain an odd number of carbon atoms and therefore would be unconjugated.

The advent of newer methods of combustion analysis for sulfur compounds, has made it possible, to obtain accurate values for the heat of combustion. It was intended that a study of the chemical and physical properties of thiaepin-1,1-dioxide be made, in terms of its heat of combustion, ultraviolet spectrum, X-ray diffraction diagram, Raman spectrum and the rate of electrophilic substitution and compared with the same chemical and physical properties of tropone.

From the evidence obtained in the above mentioned investigations it would be possible to determine the degree of aromatic character of thiaepin-1,1-dioxide and to obtain evidence of the structure and the magnitude of the expansion of the sulfur octet in this seven-membered ring.

An attempt to synthesize thiaepin-1,1-dioxide by the proposed method, was not satisfactorily terminated. As a consequence, the chemical and physical properties of the compound were not obtained.

Reaction of tetrahydro-1,4-thiapyrone with diazo methane to give 4-ketothiaepane by ring expansion was accomplished. In addition to the seven-membered ring, the oxide was also obtained and characterized. The ring enlargement of 4-aminomethyltetrahydrothiapyran-1,1-dioxide-4-ol with nitrous acid, gave the oxide as the major product and 4-ketothiaepane-1,1-dioxide as a by product. The amine was obtained by the reduction of 4-nitromethylthiapyran-1,1-dioxide-4-ol.

A mixture of  $\Delta^3$  and  $\Delta^4$  tetrahydrothiaepin-1,1-dioxide was obtained in good yield, by the pyrolysis of 4-acetoxythiaepane-1,1-dioxide. This latter compound was obtained by the reduction of 4-ketothiaepane, to 4-hydroxythiaepane followed by a peracetic acid oxidation and acetylation. An alternate route was provided by the performic acid oxidation of 4-ketothiaepane to give 4-ketothiaepane-1,1-dioxide. This compound upon catalytic reduction gave 4-hydroxythiaepane-1,1-dioxide which in acetylation gave 4-acetoxythiaepane-1,1-dioxide.

The dehydrohalogenation of a mixture of dibromothiaepane-1,1-dioxide with pyridine gave a vinyl bromide. A similar attempt using dimethylamine gave a mixture of dimethylamine bromides.

Bromination of a purified sample of either  $\Delta^3$  or  $\Delta^4$  tetrahydrothiaepin-1,1-dioxide, with N-bromosuccinimide gave an allyl bromide. Numerous attempts at allylic bromination of the mixture of  $\Delta^3$  and  $\Delta^4$  tetrahydrothiaepin-1,1-dioxide with N-bromosuccinimide failed.

48 pages. \$1.00. Mic 56-39

THE HOMOGENEOUS ACID DEGRADATION OF  
VISCOSE, HYDROVISCOSE AND HYDROCELLULOSE  
IN PHOSPHORIC ACID SOLUTION

(Publication No. 13,708)

Robert Allan Martin, Ph.D.  
Princeton University, 1955

One per cent solutions of viscose, hydroviscose, and hydrocellulose in 85 per cent phosphoric acid were studied. Samples of these solutions were removed at convenient intervals of time and poured into ice-water. All cellulosic material of a D.P. greater than about 14 is precipitated by this dilution. After these precipitates, designated as primary precipitates, were removed by centrifugation, the centrifugates were neutralized by passage through a column packed with anion exchange resin. Upon evaporation of the neutralized centrifugates, secondary precipitates of D.P.'s between 7 and 14 appeared. After removal of these secondary precipitates by centrifugation, aliquots of the centrifugates were analyzed for total reducing power with alkaline hypiodite. Other aliquots of the centrifugates were hydrolyzed completely to glucose in 1 N. HCl at 100°C. and titrated with alkaline hypiodite.

The combined weights of the primary and secondary precipitates, or water-insoluble cellulosic material, were used to calculate the rate of decrease of the water-insoluble cellulosic material.

The degrees of polymerization of the primary precipitates were measured by viscometric methods in solutions of cupriethylene diamine and by end group estimation with alkaline hypiodite. The degrees of polymerization of the secondary precipitates were measured by end group estimation alone. The average degree of polymerization of each centrifugate was calculated from the reducing power of the centrifugate before and after complete hydrolysis to glucose as measured by titration with alkaline hypiodite.

A summative average degree of polymerization, which is the average degree of polymerization of all the material in the phosphoric acid solutions, was calculated for all these materials. The rate of decrease of the summative average degree of polymerization was determined. From initial values of 1.29, 4.11 and  $1.73 \times 10^{-6} \text{ min.}^{-1}$ , the rate constants for viscose, hydroviscose and hydrocellulose, respectively, decreased to values of 0.84, 0.70 and  $0.29 \times 10^{-6} \text{ min.}^{-1}$  and then increased gradually until, at a summative average degree of polymerization of 2, values of 8.4, 11.8 and  $4.7 \times 10^{-6} \text{ min.}^{-1}$  were reached. This behavior was shown to be inconsistent with the concept of true molecular dispersion of cellulose in phosphoric acid. It was suggested that micelles or aggregates were present in the phosphoric acid solutions of viscose, hydroviscose and hydrocellulose. The rate of decrease of the weight of the water-insoluble cellulosic material was also found to be at variance with the concept of true molecular dispersion.

The rate of hydrolysis of cellobiose in phosphoric acid was measured by means of Quantitative chromatographic separation and subsequent titration of the glucose and cellobiose present in the hydrolysis mixture at various times. The rate constants for the hydrolysis was found to be  $11.1 \times 10^{-6} \text{ min.}^{-1}$ .

Chromatographic analysis of a solution of glucose in phosphoric acid revealed that the glucose combines with itself in this medium to form three disaccharides and

several higher oligosaccharides. The three disaccharides were found to be maltose, isomaltose, and an apparently new disaccharide which was neither maltose, isomaltose, gentiobiose nor cellobiose. 111 pages. \$1.39. Mic 56-40

THE SYNTHESIS AND STEREOCHEMISTRY OF  
SOME DERIVATIVES OF DECALIN  
WITH ANGULAR SUBSTITUENTS

(Publication No. 15,150)

Leon Sherwood Minckler II, Ph.D.  
Northwestern University, 1955

The synthesis and stereochemistry of angularly substituted decalin derivatives has received considerable attention in recent years. The growing interest in this system is primarily due to its occurrence in natural products, especially in steroids. Decalin derivatives with angular methyl substituents have been extensively studied while other angular substituents have for the most part been overlooked. The present investigation was undertaken to study the synthesis and stereochemistry of such systems containing angular substituents other than methyl and to utilize these substances in the synthesis of 9-methyldecalin derivatives.

A major portion of this investigation has been concerned with the synthesis of the four isomeric 10-hydroxymethyl-2-decalols. The starting material for all four of these isomers was 10-carbethoxy- $\Delta^{1:9}$ -2-octalone. Steric control of this system was found to be dependent on two factors. First, the nature of the angular group controlled the nature of the ring fusion produced by catalytic hydrogenation of the 1:9 double bond. Thus, the angular carbethoxyl group gave the trans ring fusion while hydroxymethyl, as well as methyl, were cis directing groups. Second, the nature of the ring fusion controlled the configuration of the 2-hydroxyl group. Consequently, reduction of a trans-2-decalone derivative gave rise to a cis relationship of the hydroxyl to the angular group while cis-2-decalone derivatives gave predominantly the trans isomers. Reduction of the keto group of 10-carbethoxy- $\Delta^{1:9}$ -2-octalone itself furnished predominantly cis-10-carbethoxy- $\Delta^{1:9}$ -2-decalone. By varying the order of the various reductions and by taking advantage of the steric control embodied in this system it has been possible to synthesize the four isomeric 10-hydroxymethyl-2-decalols. The melting points of these diols are listed below together with their di-p-nitrobenzoate derivatives.

|   | m.p. | DPNB |
|---|------|------|
| <u>cis</u> -10-Hydroxymethyl-2- <u>trans</u> -decalol   | 144  | 156  |
| <u>trans</u> -10-Hydroxymethyl-2- <u>trans</u> -decalol | 119  | 226  |
| <u>cis</u> -10-Hydroxymethyl-2- <u>cis</u> -decalol     | 125  | 137  |
| <u>trans</u> -10-Hydroxymethyl-2- <u>cis</u> -decalol   | 139  | 198  |

The synthesis of the isomeric 10-methyl-2-decalols is also of considerable interest. The system under investigation offers a number of possible routes to the synthesis of these alcohols, and the diols already described furnish excellent reference compounds covering all points of



asymmetry. Several methods directed toward the synthesis of the 10-methyl-2-decalols are described. Although this phase of the investigation is not complete, the chemistry involved is of interest.

A number of other angularly substituted decalin derivatives are described in this dissertation.

100 pages. \$1.25. Mic 55-41

# THERMAL CLEAVAGES OF THE CYCLOBUTANE RING DURING PYROLYSIS AND DIRECTIONAL INFLUENCES IN THE PYROLYSIS OF ESTERS

(Publication No. 15,300)

Louis Nicholas, Ph.D.  
University of Maryland, 1955

Supervisor: William J. Bailey

In order to investigate the thermal stability of the cyclobutane ring in the ester pyrolysis reaction, the compounds 1,2-di(acetoxymethyl)cyclobutane, 1,2-dimethylolcyclobutane-bis-(methyl xanthate) and 1,2-dimethylolcyclobutane-bis-(methyl carbonate) were prepared and subjected to pyrolysis. The pyrolysis of 1,2-di(acetoxymethyl)cyclobutane yielded a mixture from which was isolated 21.2 per cent of (2-methylenecyclobutyl)methyl acetate, 28.4 per cent of vinyl-1,3-butadiene and 3.5 per cent of allyl acetate (yields based on unrecovered diacetate). The pyrolysis of 1,2-dimethylolcyclobutane-bis-(methyl xanthate) yielded a mixture containing 21 per cent of 3,4-thiabicyclo[3.2.0]heptane and 30 per cent of 3,4-oxabicyclo[3.2.0]heptane. 1,2-Dimethylolcyclobutane-bis-(methyl carbonate) yielded on pyrolysis 58 per cent of 2-vinyl-1,3-butadiene and 31.6 per cent of methyl (2-methylenecyclobutyl)methyl carbonate (yields based on unrecovered dicarbonate). Due to ring cleavage or cyclic ether formation during the pyrolysis of the above esters, no 1,2-dimethylenecyclobutane was obtained.

The esters,  $\beta$ -dimethylaminoisopropyl benzoate and  $\beta$ -methoxyisopropyl acetate were prepared and subjected to pyrolysis in order to determine whether the presence of the dimethylamino or the methoxyl group alters the order of ease of elimination of hydrogen atoms,  $I^0 > II^0$ , which has been observed in pyrolyses of unsubstituted aliphatic esters. The amine obtained in 61 per cent yield from the pyrolysis of  $\beta$ -dimethylaminoisopropyl benzoate was shown to be allyldimethylamine of at least 95 per cent purity as determined by refractive index and infrared spectral measurements. Methoxyisopropyl acetate yielded on pyrolysis 83 per cent of allyl methyl ether of high purity. The isomeric propenyl methyl ether was not detectable in the pyrolysis products. The presence of the dimethylamino and the methoxyl group in each of these esters has not affected the normal course of elimination since a primary hydrogen has been eliminated in preference to a secondary hydrogen atom, in accordance with the order of elimination observed in unsubstituted aliphatic esters.

Mixtures of *cis*- and *trans*-2-methylcyclohexyl acetate (68% *trans*) and pure *trans*-2-methylcyclohexyl acetate were subjected to pyrolysis. The olefin products in each case consisted almost entirely of 3-methylcyclohexene with only small amounts (2-7%) of 1-methylcyclohexene

being present. The relative ease of elimination of hydrogen observed in aliphatic systems,  $II^0 > III^0$ , was also observed in the pyrolysis of these alicyclic esters.

86 pages. \$1.08. Mic 55-42

## PART I. THE PREPARATION OF 1,1-DIALKYLHYDRAZINES. PART II. ATTEMPTED ASYMMETRIC POLYMER SYNTHESIS.

(Publication No. 13,972)

Louis Charles Palmer, Ph.D.  
Polytechnic Institute of Brooklyn, 1956

### Part I

The purpose of this work was to prepare some 1,1- and 1,2-disubstituted cyclic hydrazines and to make them available for a study of their oxidation behavior.

2,5-Dibromohexane was reacted with hydrazine to give *cis* and *trans*-1-amino-2,5-dimethylpyrrolidine and a 3,6-dimethyltetrahydropyridazine. *cis*-1-Amino-2,5-dimethylpyrrolidine was also prepared by nitrosating 2,5-dimethylpyrrolidine followed by reduction with lithium aluminum hydride.

*trans*-1-Amino-2,5-dimethylpyrrolidine was hydrogenated over platinum oxide to give *trans*-2,5-dimethylpyrrolidine. Nitrosation of this hydrogenated product followed by reduction with lithium aluminum hydride yielded the original *trans*-1-amino-2,5-dimethylpyrrolidine.

*cis*-1-Amino-2,5-dimethylpyrrolidine was oxidized with bromine to yield a product mixture which was difficult to separate because of the large number of products present, their unstable nature, and the low yield of any individual product. *cis*-2,5-Dimethylpyrrolidine was identified as one of the oxidation products.

### Part II

Many polymers such as polystyrene and polymethyl methacrylate contain asymmetric carbon atoms of both the *d* and *l* configurations which are probably randomly distributed along the chain. It is believed that a more regular distribution of the *d* and *l* configurations or an excess of one configuration would alter the physical properties of the polymer, particularly the softening point, the degree of crystallinity, and the optical rotation.

An attempt was made to prepare an asymmetric polymer by polymerizing and copolymerizing a monomer which contained an optically active center sterically close to the propagating center of the growing polymer chain.

*o*-Vinylbenzyl *d*-*s*-butyl sulfide was prepared by the following sequence of reactions beginning with  $\alpha$ , *o*-dibromotoluene and thiourea to give *o*-bromobenzyl mercaptan. The mercaptan was reacted with *l*-*s*-butyl bromide and sodium ethoxide to give the optically active sulfide. The sulfide and cuprous cyanide at 210° yielded *o*-cyanobenzyl *d*-*s*-butyl sulfide which was reacted with methyl magnesium iodide to give the ketone, *o*-acetobenzyl *d*-*s*-butyl sulfide. Reduction with lithium aluminum hydride to the alcohol, followed by acetylation with acetic anhydride gave *o*-( $\alpha$ -acetoxylethyl benzyl *d*-*s*-butyl sulfide.

The monomer was obtained by pyrolyzing this acetate at 400°. Cleavage of the carbon to sulfur bond during pyrolysis lowered the yield and produced side products which complicated purification of the monomer.

o-Vinylbenzyl d-s-butyl sulfide was polymerized with a free radical catalyst to yield an optically active polymer. The sulfur and optically active s-butyl group was quantitatively removed from the polymer by treatment with excess Raney nickel at 150° and 1800 lbs. hydrogen pressure. The resulting polymer was not optically active and an x-ray diagram of a stretched polymer film showed the polymer to be unoriented. No significant differences in the physical properties of the polymer were found compared to a similar polymer prepared from the d<sub>8</sub>-monomer.

The optically active monomer was copolymerized with methyl methacrylate to give an optically active copolymer. After treatment with excess Raney nickel as before, the desulfurized copolymer was found to be optically inactive.

Attempted ionic polymerization of o-vinylbenzyl d-s-butyl sulfide with many typical cationic catalysts such as stannic chloride and titanium tetrachloride failed. The monomer was also shown to inhibit the cationic polymerization of styrene with stannic chloride as the catalyst.

Attempts to polymerize allyl ethyl ether, allyl ethyl sulfide, and 2-methylallyl ethyl ether with many cationic catalysts failed to yield any solid polymer.

No evidence was obtained to indicate the presence of asymmetric induction on the propagating center of the growing polymer chain in the systems investigated.

57 pages. \$1.00. Mic 56-43

#### PART I. PREPARATION AND AMINATION OF o-CHLOROANISOLE-3-d.

#### PART II. STEREOCHEMISTRY OF REDUCTION WITH LITHIUM IN ETHYLAMINE.

#### PART III. REDUCTION OF ACIDIC HYDROCARBONS WITH LITHIUM IN PRIMARY AMINES.

#### PART IV. REPLACEMENT OF HYDROGEN IN FERROCENE.

(Publication No. 14,426)

Gene E. Schroll, Ph.D.  
Purdue University, 1955

Major Professor: Dr. R. A. Benkeser

**Part I. Preparation and Amination of o-Chloroanisole-3-d.** — o-Chloroanisole-3-d containing almost one deuterium atom per molecule was prepared. Samples of it were reacted with sodamide in liquid ammonia and with lithium dimethylamide in diethyl ether to give m-anisidine and N,N-dimethyl-m-anisidine, respectively. The exchange of the deuterium atoms of the aromatic compounds with the hydrogen atoms of the solvent was observed to be an independent and simultaneous reaction in each instance. The low deuterium content of the aromatic amine from each reaction could have been due to the mechanism of amination or due solely to the independent exchange reaction. It was therefore impossible to say whether the deuterium atom shifted intramolecularly during the formation of the aromatic amines, so that the mechanism of Bunnett and Zahler (*Chem. Revs.*, 49, 382 (1951) for cine substitution remained unproven.

**Part II. Stereochemistry of Reduction with Lithium in Ethylamine.** — The reduction of a dialkylacetylene with lithium in ethylamine yielded the corresponding trans olefin and alkane; the formation of the latter product could be suppressed by carrying out the reduction at Dry Ice temperature. The trans nature of the olefin product was due only to the mechanism of reduction, for isomerization of the cis olefin to the trans olefin under reduction conditions was found to be impossible. The reduction of a dialkylacetylene with sodium in liquid ammonia had been previously reported to give only the trans olefin as a product; the exceptional reducing power of the lithium-ethylamine system was again evident, even though the mode of reduction appeared to be quite normal.

**Part III. Reduction of Acidic Hydrocarbons with Lithium in Primary Amines.** — Fluorene was reduced in good yield to 1,2,3,4-tetrahydrofluorene with lithium in a primary amine; the structure of the product was proven. Indene could not be quantitatively reduced with the reagent. The reduction of indan and 9,9-dimethylfluorene yielded saturated hydrocarbons as the major products. The lithium-primary amine system, like the sodium-ammonia system, appeared to be incapable of reducing indene salts or anions; the lithium-amine system seemed to possess an exceptional power of reduction, however, for the quantitative reduction of fluorene must have involved the reduction of fluorenyllithium.

**Part IV. Replacement of Hydrogen in Ferrocene.** — New methods of introducing substituents into ferrocene were investigated. The reaction of ferrocene with n-butyllithium and subsequently with Dry Ice was repeated; the dissociation constant of the resulting ferrocene monocarboxylic acid was found to be one-third as large as that of benzoic acid under the same conditions. The metallation of ferrocene with n-butyllithium and subsequent reaction with iodine failed to yield an iodoferrocene; the use of acetophenone in place of the iodine yielded bis-(1-hydroxy-1-phenylethyl)ferrocene. Ferrocene could not be metallated with sodamide in toluene. Ferrocene was reduced by lithium metal in liquid ethylamine, rather than metallated. Nitration with copper nitrate in acetic anhydride, bromination with n-bromosuccinimide, and direct iodination of ferrocene failed.

217 pages. \$2.71. Mic 56-44

#### PART I. REDUCTIONS WITH LITHIUM IN LOW MOLECULAR WEIGHT AMINES.

#### PART II. ACID CATALYZED CLEAVAGES OF VARIOUS TRIALKYLARYLSILANES.

(Publication No. 14,431)

Owen Howell Thomas, Ph.D.  
Purdue University, 1955

Major Professor: Robert A. Benkeser

#### PART I

The limitations and applicability of the lithium-low molecular weight amine reduction medium was studied. Both hydrocarbon and monofunctional aromatic compounds were subjected to reduction and all evidence points to greater reduction in this medium than in the sodium-ammonia



system. A plausible mechanism for these reductions is postulated on the basis of the chemical evidence observed.

## PART II.

Pseudo first-order rate constants were determined dilatometrically at 25° for trimethylphenylsilane and the isomeric trimethyltolylsilanes using a p-toluenesulfonic acid in aqueous acetic acid cleaving medium identical with that reported previously for cleaving the isomeric trimethylxylylsilanes. The order of increase in the rates of acid cleavage is (R = trimethylsilyl):  $\text{RC}_6\text{H}_5 \ll \text{m-CH}_3\text{C}_6\text{H}_4\text{R} < \text{p-CH}_3\text{C}_6\text{H}_4\text{R} < \text{o-CH}_3\text{C}_6\text{H}_4\text{R}$ . Through partial relative rate factor calculations a correlation between predicted and experimental acid cleavage rates for the trimethylxylylsilanes was made. The 2-R-m-xylene and 5-R-m-xylene isomers gave poor correlation with the predicted values while the remaining isomers were in good agreement.

Support for the Eaborn mechanism in the acid cleavage of trialkylarylsilanes was found. The acid cleavage rates for  $\text{Me}_3\text{SiC}_6\text{H}_5$ ,  $\text{Me}_2\text{EtSiC}_6\text{H}_5$ ,  $\text{Et}_3\text{SiC}_6\text{H}_5$  and  $\text{i-Pr}_3\text{SiC}_6\text{H}_5$  were found to decrease with increasing size of the alkyl groups around silicon.

In the acid cleavage of the isomeric trimethylsilylnaphthalenes and the meta and para trimethylbromophenylsilanes, the order of increase in the cleavage rate is (R = trimethylsilyl):  $\text{m-BrC}_6\text{H}_4\text{R} < \text{p-BrC}_6\text{H}_4\text{R} < \text{C}_6\text{H}_5\text{R} < \text{2-R-C}_{10}\text{H}_7 < \text{1-R-C}_{10}\text{H}_7$ . A plot of log partial relative rate factor against  $\sigma$  for the p-CH<sub>3</sub>, m-CH<sub>3</sub>, p-Br, m-Br and 3-4 (CH<sub>3</sub>)<sub>2</sub> groups in these detrimethylsilation reactions gave a linear relationship. 188 pages. \$2.35. Mic 56-45

## DIMETHYL-1,3,5-HEXATRIENES

(Publication No. 15,311)

Alfred Viola, Ph.D.

University of Maryland, 1955

Supervisor: Professor G. Forrest Woods

The purposes of this investigation were the preparation of some dimethyl-1,3,5-hexatrienes, which may be considered as the open chain analogs of p-, m-, and o-xylene, and the study of some of their properties.

Hydrogenation of 2,5-dimethyl-3-hexyn-2,5-diol was readily arrested at the ethylene stage, and the resulting 2,5-dimethyl-3-hexen-2,5-diol was dehydrated catalytically with alumina to yield 2,5-dimethyl-1,3-hexadien-5-ol, or, at a higher temperature of dehydration, 2,5-dimethyl-1,3,5-hexatriene. The dienol was converted to the triene by further dehydration. The maleic anhydride adduct of 2,5-dimethyl-1,3,5-hexatriene was aromatized to 5-methyl-3-isopropylphthalic anhydride.

A by-product of the preparation of 2,5-dimethyl-1,3,5-hexatriene was 1,4-dimethylcyclohexadiene. The location of the unsaturation in this compound is not known. This same substance was prepared directly by catalytic dehydration of either 2,5-dimethyl-3-hexen-2,5-diol or 2,5-dimethyl-1,3-hexadien-5-ol at 500°, or by heating the triene in the vapor phase at 500°. Aromatization of 1,4-dimethylcyclohexadiene yielded p-xylene.

The Grignard reaction of 3-chloro-2-methyl-1-propene

with methyl vinyl ketone yielded 2,4-dimethyl-1,5-hexadien-4-ol. Dehydration of this dienol with various dehydrating agents yielded 1,3-dimethylcyclohexadiene, which was aromatized to m-xylene. Again, the position of unsaturation in the cyclic diene is not known. That 2,4-dimethyl-1,3,5-hexatriene was also formed during some of these dehydrations was ascertained from the ultraviolet spectra of the dehydration products, but the pure triene was not isolated.

The reaction of 2,4-hexadienal with ethylmagnesium bromide yielded 2,4-octadien-6-ol, which was dehydrated with alumina to yield a triene, which is either 1,6-dimethylhexatriene or 1-ethylhexatriene. This substance was highly unstable in the presence of air. At higher dehydration temperatures a mixture of 1,2-dimethylcyclohexadiene and ethylcyclohexadiene resulted. Aromatization of this mixture yielded a mixture of o-xylene and ethylbenzene.

Dehydration of 2,4-hexadien-1-ol with alumina at 500° yielded a mixture of unsaturated substances, one of which was cyclohexadiene as evidenced by its ready conversion to benzene.

These various cyclizations, which now appear to be a general reaction of trienes, have been interpreted as resulting from an internal Diels-Alder reaction.

Since the various trienes, their precursors, and their derivatives often have characteristic ultraviolet absorption spectra, a considerable amount of work was done in this field. A new method of representing ultraviolet spectra which enhances the observable fine structure was developed. 154 pages. \$1.93. Mic 56-46

## THE CLAISEN REARRANGEMENT. THE ALLYL AND CROTYL ETHERS OF 2,4-DIMETHYL-6-PROPENYLPHENOL.

(Publication No. 14,563)

Donald Walter Wujciak, Ph.D.

University of Minnesota, 1954

Major Advisor: W. E. Noland

In 1926 Claisen and Tietze<sup>1</sup> reported the following rearrangements: (1) the allyl ether of 2,4-dimethyl-6-propenylphenol (I) to 2,4-dimethyl-6-(2-methyl-1,4-pentadienyl)phenol (IV), (2) the allyl ether of 2-methoxy-4-propyl-6-propenylphenol (II) to 2-methoxy-4-propyl-6-(2-methyl-1,4-pentadienyl)phenol and (3) the allyl ether of 2,4-dichloro-6-propenylphenol (III) to 2,4-dichloro-6-(2-methyl-1,4-pentadienyl)phenol.

The present investigation was undertaken to prove unequivocally the structure of the rearrangement product of I, and to determine if rearrangements of this type proceed without inversion of the migrating group. The crotyl ether of 2,4-dimethyl-6-propenylphenol was chosen for study, since rearrangement in this case would lead to different products depending upon whether or not inversion takes place.

Thermal rearrangement of I yielded a liquid phenol IV which was converted into a more easily synthesized form, the methyl ether (VI) of 2,4-dimethyl-6-(2-methyl-1,3-pentadienyl)phenol, by shifting the terminal double bond into conjugation and methylating the phenolic hydroxyl.

The structure of VI was proven by two methods: (1) Ozonolysis of VI in the presence of 2,4-dinitrophenylhydrazine yielded a red 2,4-dinitrophenylhydrazone, m.p. 219-220°. A mixed melting point of this material with the 2,4-dinitrophenylhydrazone (VII) of 2-methoxy- $\alpha$ ,3,5-trimethylcinnamaldehyde, m.p. 219-220°, showed no depression. VII was prepared by the condensation of the methyl ether of 3,5-dimethylsalicylaldehyde and propionaldehyde, followed by conversion of the product, 2-methoxy- $\alpha$ ,3,5-trimethylcinnamaldehyde, to its 2,4-dinitrophenylhydrazone. (2) The methyl ether (VIII) of 2,4-dimethyl-6-(2-methyl-1,3-pentadienyl)-phenol was synthesized independently by treating the Grignard reagent of 2-bromo-3-pentene with the methyl ether of 3,5-dimethylsalicylaldehyde, followed by dehydration of the product, 1-(2-methoxy-3,5-dimethylphenyl)-2-methyl-3-penten-1-ol, with potassium bisulfate at 190°. Comparison of the infrared spectra of VI and VIII proved their identity, thus supporting the structure assigned by Claisen and Tietze.<sup>1</sup>

The proof of structure of the crotyl ether (V) of 2,4-dimethyl-6-propenylphenol was accomplished by catalytic hydrogenation of V and the preparation of the *n*-butyl and *s*-butyl ethers of 2,4-dimethyl-6-propylphenol. Comparison of the infrared spectra of the catalytically reduced crotyl ether from V and the *n*-butyl ether of 2,4-dimethyl-6-propylphenol proved their identity.

Thermal rearrangement of V yielded a liquid phenol, 2,4-dimethyl-6-(2-methyl-1,4-hexadienyl)-phenol (IX). IX was isomerized to a conjugated diene and the phenolic hydroxyl was methylated to yield a more easily synthesized form of IX, the methyl ether (X) of 2,4-dimethyl-6-(2-methyl-1,3-hexadienyl)-phenol.

Ozonolysis of X in the presence of 2,4-dinitrophenylhydrazine yielded a red 2,4-dinitrophenylhydrazone, m.p. 219-220°. A mixed melting point of this material with the 2,4-dinitrophenylhydrazone (VII) of 2-methoxy- $\alpha$ ,3,5-trimethylcinnamaldehyde, m.p. 219-220°, showed no depression. This fact can be explained only if no overall inversion of the crotyl residue occurs during the thermal rearrangement of V.

A second proof of structure was obtained by the independent synthesis of the methyl ether (XI) of 2,4-dimethyl-6-(2-methyl-1,3-hexadienyl)-phenol. This was accomplished by treating *n*-propyl magnesium iodide with 2-methoxy- $\alpha$ ,3,5-trimethylcinnamaldehyde, followed by dehydration of the product, 1-(2-methoxy-3,5-dimethylphenyl)-2-methyl-1-hexen-3-ol, with potassium bisulfate at 190°. The infrared spectrum of XI did not agree in all respects with that of X, but this lack of identity was resolved when XI, which had been prepared under acidic conditions, was treated with methanolic potassium hydroxide. Following this treatment, the spectra of X and XI were sufficiently close to show that the great majority of the material obtained from the thermal rearrangement product of the crotyl ether of 2,4-dimethyl-6-propenylphenol was the methyl ether of 2,4-dimethyl-6-(2-methyl-1,3-hexadienyl)-phenol.

The similarity of the *para*-Claisen rearrangement to the rearrangement to the *ortho*-propenyl side chain discovered by Claisen and Tietze<sup>1</sup> and furthered by the present work leads to proposal of a mechanism analogous to that of Hurd and Pollack<sup>2</sup> for the *para*-Claisen rearrangement.

91 pages. \$1.14. Mic 56-47

1. L. Claisen and E. Tietze, *Ann.*, **449**, 81 (1926).
2. C. D. Hurd and M. A. Pollack, *J. Org. Chem.*, **3**, 550 (1939).

## CHEMISTRY, PHARMACEUTICAL

### UNSYMMETRICALLY SUBSTITUTED PIPERAZINES AND ETHYLENEDIAMINES

(Publication No. 14,686)

Lester Chafetz, Ph.D.

The University of Wisconsin, 1955

Supervisor: Assistant Professor William O. Foye

The therapeutic applications of a wide variety of 1,4-unsymmetrically disubstituted piperazines and of amino-s-triazines have been summarized, and their chemistry has been briefly described. Literature on the synthesis of unsymmetrically substituted piperazines has been critically reviewed.

Aminolysis of diethyl carbonate has been found preferable to carbethoxylation with chloroformate for the preparation of ethylenediamine monourethan. However, the reaction was inapplicable to piperazine under the conditions studied. By-products formed in the reaction depend on its duration. Improved procedures for the preparation of 1-alkyl and 1-acylpiperazines have been described.

A non-hydrolytic, non-reductive procedure for the cleavage of benzyl urethans previously applied in peptide syntheses, the use of hydrogen bromide in glacial acetic acid, has been found applicable for removal of carbethoxy groups also. The procedure provides a more facile method for decarbethoxylation of 1-alkyl-4-carbethoxy-piperazines than those previously described. It has been found that cleavage of urethan groups occurs preferentially to disruption of sulfonamide and carboxamide bonds, thus making available 1-acyl piperazines in better yields than previously obtainable. A mechanism for the process has been advanced.

Decarbethoxylation of piperazines, a sluggish procedure in boiling alkali, has been found to proceed rapidly at room temperature under Schotten-Baumann conditions. Replacement of the urethan moiety by the acyl group occurs. The preparative utility of this reaction has been investigated. Possible mechanisms were discussed.

A number of piperazine and ethylenediamine derivatives of cyanuric chloride and melamine were prepared for pharmacological evaluation. An attempt has been made to correlate their structural features with their ultraviolet absorption spectra. Several workers have reported difficulty in elemental analyses of some s-triazines, a phenomenon encountered in this work. The use of ultraviolet spectra has been found to be a valuable adjunct in the characterization of such compounds.

95 pages. \$1.19. Mic 56-48



## ANALOGS OF SYMPATHOMIMETIC AMINES

(Publication No. 12,992)

Raymond Julius Kahl, Ph.D.  
University of Washington, 1955

Three series of compounds were prepared which are similar in chemical structure to amines that are known to possess sympathomimetic activity. These contain the furan, tetrahydrofuran, and cyclooctane rings, with the appropriate ethylamine, N-methylethylamine, isopropylamine, and N-methylisopropylamine side chains.

2-Furfural was the starting material for the preparation of the furan and tetrahydrofuran compounds. The aldehyde was condensed with nitromethane and nitroethane to produce their respective nitroalkenes which were reduced with lithium aluminum hydride to form the corresponding amines. The N-methyl- $\beta$ -(2-furyl)alkylamines were synthesized by the reaction of the primary amines with chloral to form the N-formyl compounds, which were reduced to the respective N-methyl amines with lithium aluminum hydride. The tetrahydrofuran compounds were produced by the catalytic reduction of the corresponding 2-furylalkylamines. The catalyst employed in this reduction was PdO-Pd, and the solvent was ethanol which contained a five per cent excess of hydrochloric acid.

The starting material for the preparation of the cyclooctylalkylamines was cyclooctanone.  $\beta$ -Cyclooctylethylamine was obtained by the catalytic hydrogenation of cyclooctenylacetonitrile with Raney nickel (W-4) as the catalyst. N-methyl- $\beta$ -cyclooctylethylamine was produced by the reduction of N-formyl- $\beta$ -cyclooctylethylamine with lithium aluminum hydride.  $\beta$ -Cyclooctylisopropylamine was synthesized by the reduction of cyclooctylacetone oxime with lithium aluminum hydride. N-methyl- $\beta$ -cyclooctylisopropylamine was obtained by the catalytic reduction of cyclooctylacetone in the presence of methylamine. The catalyst used in this reduction was Raney nickel (W-4).

The preparation of an analogous series of compounds with the tetrahydrothiophene ring was attempted, but none of these amines were obtained. The various synthetic routes employed in this work were discussed.

115 pages. \$1.44. Mic 56-49

## CHEMISTRY, PHYSICAL

POLYMERIC AMINES TITRATION BEHAVIOR  
AND REACTIONS WITH METAL IONS

(Publication No. 13,805)

Robert Bastian, Ph.D.  
Polytechnic Institute of Brooklyn, 1956

The principle object of this investigation was to study the reactions of polymeric amines with metal ions and to compare the stability constants with those of monomeric analogues. The procedure used was primarily a modification of the method of Bjerrum, although a spectrophotometric method was also employed.

The titration behavior of the amines studied, polyethylenimine, polyvinylamine, and N-methyl polyethylenimine, was found to be different from that of polymeric acids such as polyacrylic acid. In general the titer in the absence of salt did not correspond to the total nitrogen content, and in the case of N-methyl polyethylenimine, the titer obtained even in 1M salt was considerably less than theoretical. The modified Henderson-Hasselbach equation

$$\text{pH} = \text{pK}_a - n \log \frac{1 - \alpha}{\alpha}$$

was found inapplicable even in the presence of 1M salt when  $\alpha$  was calculated on the basis of the theoretical titer. By breaking the titration curves into two branches, however, each branch was found to fit an equation of this form. The reason for this behavior is not clear, but it must be connected with the high charge density which prevails in polymers of this type.

The reaction of polyethylenimine with several metal ions was studied potentiometrically and the order of reactivity was found to be similar to that of monomeric amines. To evaluate the stability constants, the acid dissociation constant was evaluated as a function of the average charge on the polymer, and appropriate methods were then used to evaluate this in the presence of the metal ions. Fortunately, in the case of several metal ions this function was not a critical one. The method of Gregor was then used to evaluate the stability constants.

In all cases where these could be evaluated they were considerably higher than those of monomeric amines, showing the enhancement produced by the polyelectrolyte chain.

Using the titer obtained in 1M salt as a basis for the calculations, three moles of polyethylenimine appeared to be bound per mole of copper(II). This was checked spectrophotometrically and confirmed. The constant calculated from the spectrophotometric data was in good agreement with that obtained by titration. The ratio of three to one obtained may not have the usual significance, however, because the polymer titrated as if two ligands were present.

In the case of other metals, such as nickel(II) and zinc(II), a greater number of ligands, probably four, appeared to be bound per mole of metal.

150 pages. \$1.88. Mic 56-50

INTERMOLECULAR FORCES AND EQUATION  
OF STATE OF LIQUIDS

(Publication No. 14,687)

John Spillers Dahler, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Joseph O. Hirschfelder

In the first part of this thesis a new approach to the cell theory of liquids is presented. To obtain practical results from the cell theories of liquids, it seems necessary to assume a simple symmetry for the distribution of a molecule about its lattice site. This is accomplished by replacing the interaction of the molecule with its neighbors by some "suitably averaged" interaction. In the Lennard-Jones and Devonshire treatment, the pair interaction is replaced by its spatial average. We find that a

Boltzmann-type average is much more satisfactory. For an assumed symmetry of the distribution, our procedure provides an extension of Kirkwood's theory such that the resulting integral equation for the distribution function can be solved by numerical methods.

The introduction of the Boltzmann-type averaging provides a pair wise correlation between the motions of molecules in neighboring cells. These correlative effects have been neglected in previous cell theories of the liquid phase. Numerical calculations of the equation of state and thermodynamical properties are, at present, being carried out at the Wright-Patterson Air Force Base.

In evaluating the integrals which arise in this development, we have found the function  $L_0$  defined by the double surface integral

$$\iint f(r_{12}, r_1, r_2, R) d\omega_1 d\omega_2 / \iint d\omega_1 d\omega_2$$

$$= \frac{1}{R} \int_{r_{12}(\min)}^{r_{12}(\max)} f(r_{12}, r_1, r_2, R) L_0(r_1/R, r_2/R, r_{12}/R) dr_{12}$$

to be extremely useful. Here,  $r_1$  and  $r_2$  are the radii of two spheres,  $R$  the separation of their centers,  $r_{12}$  the separation of points on the two spheres, and  $f$  an arbitrary integrable function of  $r_{12}/R$ .  $L_0$  is found to be a quadratic function of  $r_{12}$ , different for various subranges of the interval  $[r_{12}(\max), r_{12}(\min)]$ . For a variety of physical problems such as X-ray and electron diffraction,  $L_0$  may have application.

In the second part of the thesis the quantum mechanical perturbation theory is applied to the calculation of the "coulombic interactions" between molecules. By "coulombic interactions" we mean to include all electrostatic, resonance, inductive, and dispersive interactions which do not depend upon the exchange of electrons between the interacting molecules. Explicit expressions for the angle-dependence of these various types of interactions are presented for the case of two molecules. These expressions are then compared to the corresponding interactions between three molecules in order to determine the nature of the non-additivity of intermolecular forces. Two distinctly different types of non-additive contributions to the intermolecular forces are discovered and their magnitudes estimated. The first type of non-additivity is present only when the unperturbed state of the three interacting molecules is degenerate. This "degeneracy non-additivity" can be very large when one or more of the colliding molecules is in an electronically excited state. In order to demonstrate this sort of non-additivity we have considered two special cases, (a) the interaction energy of three Hydrogen atoms, two in the ground state and the third in the first excited state, (b) the interaction of two polar, non-degenerate molecules with a Hydrogen atom in its first excited state.

The second type of non-additivity occurs not only in the degenerate case, but also for non-degenerate states. However, these forces are small unless the colliding molecules are polar or quadrupolar in nature. Explicit representations of these interactions are presented for the special cases of polar and quadrupolar molecules with cylindrical symmetry. To demonstrate the case of polar molecules we calculate the non-additive interaction energy between various hydrogen-halide molecules. In the case of quadrupolar molecules we calculate the non-additive interaction energy between three Hydrogen molecules.

In all of our calculations we have neglected third and higher order terms in the perturbation.

96 pages. \$1.20. Mic 56-51

# STUDIES ON THE LINEAR CRYSTALLIZATION VELOCITY OF SODIUM ACETATE IN SUPERSATURATED SOLUTIONS

(Publication No. 15,086)

Paul Luther Dietz, Jr., Ph.D.  
University of Pittsburgh, 1955

In this work the following experimental measurements were made:

1. The final temperature after adiabatic crystallization of  $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$  from supersaturated aqueous solutions was measured as a function of initial temperature and initial concentration.
2. The linear crystallization velocity of  $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$  in aqueous solutions containing various amounts of acetic acid or sodium hydroxide was measured as a function of initial temperature and initial concentration of sodium acetate.
3. The rate of dissolving of crystals of  $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$  in water was measured as a function of temperature. The activation energy was found to be about  $(7.5 \pm 0.5)$  kcal./mole.
4. The rates of growth of some individual crystals were measured.

By using the results of these measurements together with some data from other workers, attempts were made to explain the observed variation of the linear crystallization velocity of  $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$  from supersaturated aqueous solutions as a function of temperature and concentration. Sodium acetate was chosen for this study because strongly supersaturated solutions are easily obtained.

It was concluded that neither the removal of the heat of crystallization nor the diffusion of solute to the growing crystal surfaces is likely the sole rate-determining step, but that the crystallization velocity is fundamentally determined by some surface process, the rate of which depends on the temperature and the concentration of the solution next to growing crystal surfaces. Mathematical equations are given which indicate, at least qualitatively, the effects of crystal size, shape, and rate of growth upon the steady state temperature and concentration at the growing surface of a single crystal. The effects of neighboring crystals are also considered.

Some observed rates of growth of individual crystals were found to be about ten times as large as can be accounted for on the basis of the rate that solute can diffuse to the growing surfaces if one uses a value for the diffusion coefficient which is given in the literature for very dilute solutions. This suggests that convection currents are set up during the crystallization process, or that the diffusion coefficient in the concentration range where the growth measurements were made is about ten times as large as that measured in dilute solutions, or that there is a very rapid surface diffusion.

It was found that a simple forward and reverse rate theory alone cannot account for the observed variation of linear crystallization velocity with temperature, whether



the seeding temperature or the final temperature after adiabatic crystallization is used in the equation resulting from this theory. Comparison between experimental and theoretical curves suggests that some kind of thermodynamic barrier may be involved. Volmer's equation, which assumes that two-dimensional nucleation is the rate determining step, is in better agreement with experimental data in the region where the crystallization velocity decreases with temperature.

An explanation for the possible false nature of the interval of constant maximal velocity is given which is consistent with the appearance of the visible phase boundary between crystals and supersaturated solution for various experimental conditions.

It was found that the variation of the maximum crystallization velocity with concentration of the solution conforms to a linear relation between  $\ln V_{\max}$  and  $1/T_{\text{sat}}$ , where  $V_{\max}$  is the maximum rate obtainable for a solution of given concentration, and  $T_{\text{sat}}$  is the saturation temperature for the solution. This linearity is predicted by both the simple forward and reverse rate theory and on the basis of Volmer's equation. The activation energy for the reverse rate obtained from this plot in accordance with the simple forward and reverse theory is, however, about three times the experimentally determined activation energy for dissolving  $\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$  in pure water.

The measurements of the crystallization velocity in solutions containing acetic acid or sodium hydroxide were made to determine how hydrolysis should tend to affect the rate. Some possible interpretations of the rather complicated results are given. In any case, it may be concluded that hydrolysis, to whatever extent it occurs, tends to reduce the rate.

141 pages. \$1.76. Mic 56-52

#### STOICHIOMETRY AND KINETICS OF THE GAS PHASE REACTION OF NITROGEN DIOXIDE AND AMMONIA

(Publication No. 13,691)

Felix Falk, Ph.D.  
Princeton University, 1955

The gas phase reaction of nitrogen dioxide and ammonia has been studied between the temperatures of 22°C and 450°C. Below 100°C the reaction can be represented quantitatively by



Small amounts of nitric oxide and nitrous oxide, generally less than 0.5% at these temperatures, are also formed. As the temperature is raised the amounts of these two gases increase reaching 1% to 5% at 205°C and still greater percentages at more elevated temperatures.

An analysis of the data from 22°C to 205°C shows that the initial rates follow a third order law,

$$-\frac{dP}{dt} = k [\text{NO}_2]^2 [\text{NH}_3],$$

with an activation energy of -12.8 kcal. Since this is approximately equal to the energy of dissociation of dinitrogen tetroxide and since the rate depends on the second power of the nitrogen dioxide pressure it is concluded that the rate controlling step is a collision between an ammonia

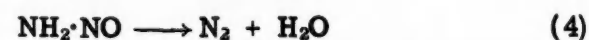
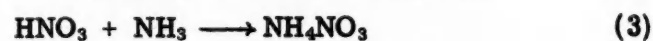
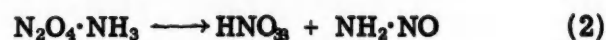
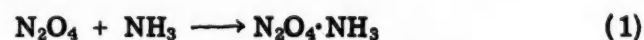
molecule and a dinitrogen tetroxide molecule. If this is the case the true activation energy of such a collision is approximately zero.

A further examination of the data indicates that the reaction proceeds with a positive deviation from the initial third order kinetics. This is shown to be due to the effect of the water vapor which is formed during the primary reaction. The total kinetic expression which holds for the reaction is then

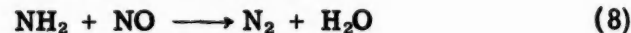
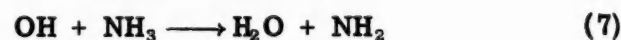
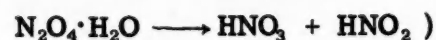
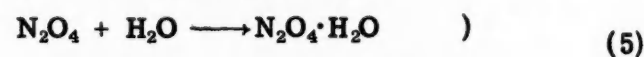
$$-\frac{dP}{dt} = k [\text{NO}_2]^2 [\text{NH}_3] + k' [\text{NO}_2]^2 [\text{H}_2\text{O}].$$

The activation energy associated with  $k'$  is found experimentally to be -7 kcal. If a dinitrogen tetroxide-water collision is the rate controlling step of this process then the true activation energy is approximately 6 kcal.

The initial process in the ammonia-nitrogen dioxide system is thought to proceed by way of reactions (1) through (4)

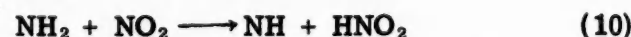
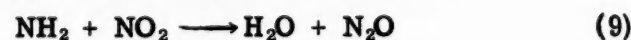


As soon as water is formed reactions (5) through (8) begin to take part in the overall process.



If either (1) or (2) and either part of (5) are slow with respect to the other steps the kinetics would be those found experimentally.

To explain the formation of nitric oxide and nitrous oxide reactions (9) and (10) are introduced.



The reaction of nitrogen dioxide with  $\text{NH}_2$  radicals leaves excess nitric oxide which otherwise would have been consumed via reaction (8).

It is suggested that reaction (5) followed by decomposition of the nitric and nitrous acids to form hydroxyl radicals could explain the strange dependence of rate on total pressure and on ratio of reactants which is shown by the ammonia-oxygen reaction. 89 pages. \$1.11. Mic 56-53

#### KINETIC STUDIES OF THE ENZYME FUMARASE

(Publication No. 14,696)

Carl Frieden, Ph.D.  
The University of Wisconsin, 1955

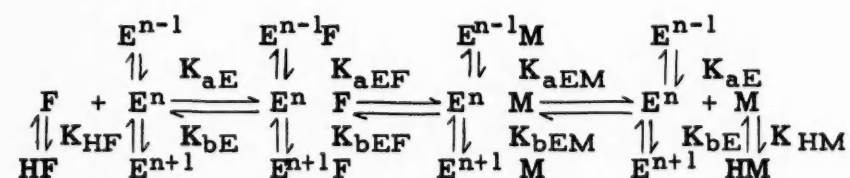
Supervisor: Associate Professor Robert A. Alberty

Crystalline fumarase which catalyzes the reversible hydration of fumarate to L-malate has been isolated from

pig heart muscle and purified in order to study the mechanism of fumarase action by means of the kinetics of the overall reaction. The protein gives a single moving boundary in the velocity ultracentrifuge and electrophoresis apparatus.

Maximum initial velocities and Michaelis constants for both substrates have been determined as a function of pH, concentration of phosphate buffer and concentration of tris-(hydroxymethyl)-aminomethane acetate buffer at 25° using purified enzyme. Inhibition constants have been determined as a function of pH for several competitive inhibitors in phosphate buffers and in 0.005 M acetate buffer. The effect on the overall reaction of changing the buffer and substrate concentration at a constant pH suggests that there are at least two sites on the enzyme molecule which influence the kinetic behavior. The substrate, when bound to one of these sites, the active site, undergoes reaction to form product. Buffer anions, when bound to the active site act as competitive inhibitors and cause an increase in the Michaelis constant. The other site, the activating site, can bind buffer or substrate anions and affect the active site in such a way as to increase both the maximum initial velocity and the Michaelis constant. Kinetic data obtained in the region where substrate activation occurs are not easily interpreted.

The dependence upon pH of the kinetic constants can be explained in terms of two ionizable groups in the catalytically active site which have to be in a certain ionized form for the product to be formed. If the complication of substrate activation or inhibition and varying buffer concentration are neglected, the effect of pH can be accounted for by the following expansion of the mechanism which appears to be the simplest mechanism which can represent all the facts.



In this mechanism, the enzyme is considered to exist in three forms where  $n$  is the net negative charge of the groups in the active form,  $F$  and  $M$  represent the doubly charged anions of fumarate and L-malate while  $HF$  and  $HM$  represent the singly charged anions. The ionization constants  $K_{aE}$ ,  $K_{bE}$ ,  $K_{aEM}$ ,  $K_{bEM}$ ,  $K_{aEF}$  and  $K_{bEF}$  have been determined from the experimental data by use of plots of  $V_s$  vs. pH and  $V_s/K_s$  vs. pH at five acetate concentrations. The ionization constants for the free enzyme appear to have the same values no matter which substrate is used as required by the mechanism. Ionization constants  $K_{aEI}$  and  $K_{bEI}$  have been determined for several competitive inhibitors in 0.005 M acetate buffer. The pH-independent Michaelis constants and maximum initial velocities have been calculated from a knowledge of the ionization constants of groups in the active site.

Experiments with deuterium oxide show that the hydrogen atom of water is incorporated in only one position in the hydration reaction. The same hydrogen is removed in the dehydration reaction. When the dehydration reaction is carried out in a medium of deuterium oxide, deuterium is incorporated into the L-malate at a rate faster than can be accounted for by the back reaction. This is evidence of another complex between the enzyme-L-malate and

enzyme-fumarate complexes. The enzyme therefore appears capable of catalyzing the exchange of a hydrogen atom without removing a hydroxyl group. It is concluded that the addition or removal of the elements of water takes place in a cis manner. 126 pages. \$1.58. Mic 56-54

## THE CRYSTAL STRUCTURE OF STYRENE PALLADIUM CHLORIDE

(Publication No. 15,416)

James Richard Holden, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Norman C. Baenziger

Palladium and platinum dichloride form planar square coordination compounds involving hybrid orbitals of the  $dsp^2$  type. Normally, coordination bond formation takes place only with ligands which contain a "lone pair" of electrons. However, certain olefins, compounds which do not contain lone pair electrons, have been found to form stable coordination compounds with palladium and platinum chloride. These olefin complexes contain one molecule of olefin per metal atom and exist in the form of dimers — i.e., twice the simplest empirical formula. The structure of styrene palladium chloride has been determined to gather information on this unusual type of compound.

Styrene palladium chloride was prepared from palladium chloride dihydrate employing dibenzonitrile palladium chloride as an intermediate. Crystals were grown from a solution of the compound in styrene. Single crystal diffraction data was obtained by both Weissenberg and precession methods.

The unit cell of styrene palladium chloride is monoclinic with the following dimensions:  $a = 13.50 \text{ \AA}$ ,  $b = 4.99 \text{ \AA}$ ,  $c = 19.19 \text{ \AA}$ ,  $\beta = 135^\circ 31'$ ,  $V = 922 \text{ \AA}^3$ ,  $D_x = 2.02 \text{ gm./cc}$ ,  $Z = 4$ . The space group is  $P2_1/c$ .

Weissenberg intensity films were obtained by the multiple film technique and reflection intensities were estimated by visual comparison of the photographic blackenings with those of a graduated intensity scale. The approximate positions of the palladium and chlorine atoms were determined by trial and error and by interpretation of Patterson and electron density projections. Structure factor signs were determined from the coordinates of these positions and used in the computation of the electron density in three dimensions. The observed electron density distribution contains maxima which give the positions of all of the atoms of the compound. These atomic positions were corrected for series termination errors by means of a three dimensional back-shift method employing the calculated electron density.

The styrene palladium chloride dimer is joined by a double chlorine bridge. This same configuration has been found in the structure of ethylene palladium chloride and may be assumed to exist in all compounds of the olefin palladium (platinum) chloride type. It has been proposed that the olefin-metal linkage in these compounds consists of an interaction between one of the  $dsp^2$  orbitals of the metal atom and the  $\pi$  orbital of the olefin double bond. The positions of the palladium and chlorine atoms with regard to



the plane of the ethylene group in styrene palladium chloride are entirely consistent with this theory.

87 pages. \$1.09. Mic 56-55

# DIELECTRIC RELAXATION AND MOLECULAR INTERACTIONS IN LIQUIDS

(Publication No. 13,699)

Russell Sedgwick Holland, Ph.D.  
Princeton University, 1954

This dissertation consists of three main sections, (1) a discussion of general aspects of dielectric theory, (2) a description of the apparatus used by the author and accompanying experimental methods, and (3) presentation and interpretation of the experimental data.

The historical development of dielectric theory is followed, from Debye's concept of the permanent dipole in molecules, leading to his renowned equation, and into the dynamic aspects of dielectric relaxation. Included is a brief discussion of recent attempts to correct for the internal field, the kinetic approach to dielectric relaxation and consideration of distribution of relaxation times.

Apparatus and experimental methods are detailed for microwave measurements of dielectric constant and loss factor at 1.24, 3.22, 10.7 and 30 centimeters wavelength. A waveguide system is employed for measurements at the two shorter wavelengths, while the 10.7 cm. work is done with a coaxial slotted line cell, and 30 cm. methods use both a coaxial slotted line cell and a coaxial resonant cavity. Also described are measurements of static and optical dielectric constants, density and viscosity.

Molecules investigated fall into three categories, (1) substituted methanes, (2) hexamethyldisiloxane, and (3) heterocyclic compounds. In a study of the effects of dipole interactions and viscosity on relaxation times of the substituted methanes, measurements were made on pure polar liquids and on solutions of these liquids in the non-polar solvents heptane, nujol and carbon tetrachloride. The compounds investigated by the author were 2,2-dichloropropane, 2,2-dinitropropane and methyl chloroform. It was observed that the relaxation times of these nearly spherical molecules were essentially independent of the macroscopic viscosity of the medium. On the other hand, comparisons of observed relaxation times in pure polar liquids and their solutions in non-polar solvents gave indications of dipole interactions lengthening relaxation times in the highly polar medium of the pure liquid, although uncertainties in the required internal field correction make such comparisons difficult to evaluate.

The molecule of hexamethyldisiloxane was investigated to ascertain the existence and magnitude of a permanent dipole moment and the atomic polarization, since conflicting evidence existed in the literature. Microwave measurements of dielectric constant and loss, although near one end of the dispersion region, were sufficiently reliable to permit a calculation of the dipole moment and, accompanied by a rather extensive extrapolation, the total induced polarization. These two quantities also were determined, independent of the previous method, from the temperature dependence of the static dielectric constant. A further check of the dipole moment was made with the

aid of the Onsager equation. Finally, a determination of the dielectric constant of the solid hexamethyldisiloxane at  $-80^{\circ}$  provided a value of the total induced polarization. The methods checked excellently.

The eight heterocyclic compounds measured in the pure state from  $1^{\circ}$  to  $60^{\circ}$  were pyridine,  $\gamma$ -picoline, pyrrole, pyrrolidine, quinoline, isoquinoline, thiophene and furan. Pyridine was also investigated as polar solute in non-polar solvent. The observed critical wavelengths generally follow changes in macroscopic viscosity and molecular size, but several significant deviations are in evidence.  $\gamma$ -Picoline, whose viscosity is slightly less than that of pyridine, shows a definitely greater critical wavelength, ostensibly due to the hindering of orientation by the methyl group of the former compound.

Pyrrolidine, with a viscosity only 70 percent of that of pyrrole, has a critical wavelength over one and one-half times greater. The cause is believed to be due to the possibility of hydrogen bonding in pyrrolidine. Quinoline and isoquinoline, with identical sizes and shapes and nearly equal viscosities, orient in different manners as evidenced by the relaxation time of the latter compound being about 50 percent higher than that of quinoline.

138 pages. \$1.73. Mic 56-56

# STRUCTURAL APPLICATIONS OF RADIOFREQUENCY SPECTROSCOPY

(Publication No. 15,222)

Charles Hawthorne Holm, Ph.D.  
University of Illinois, 1955

The application of high resolution nuclear magnetic resonance spectroscopy has revealed several new and interesting areas of research in the field of molecular structure. In this work we deal with two such areas.

When two magnetic nuclei, or groups of magnetic nuclei, of the same nuclear species which are located at chemically nonequivalent sites and which give rise to two distinct resonances periodically exchange places between their nonequivalent sites, the position of their resonances may change (at fixed applied external magnetic field). In the first part of this work the effect of the exchange of the nuclei on the resonance is treated as a special case of motional narrowing of resonance lines. The results of previous investigators are extended to show the dependence of the separation between the two lines on the exchange rate and on the inverse line-width parameter  $T_2$ . The results obtained are applied to N,N-dimethylformamide (DMF) and N,N-dimethylacetamide (DMA). In these compounds the proton resonances of the hydrogen atoms on the N-substituted methyl groups appeared as doublets at room temperature. As the temperature was raised the two lines of each doublet moved together and coalesced into a single line at a critical temperature. The temperature dependence of the separation between lines is interpreted in view of a hindered internal rotation about the C-N bond and is used to calculate an energy barrier to rotation. The low activation energies obtained,  $7 \pm 3$  and  $12 \pm 2$  kcal for DMF and DMA respectively, are discussed in terms of transmission coefficients and entropy of activation. The positive entropy of activation obtained suggests that the

activated complex formed at the top of the potential energy barrier is much more highly ordered than the normal states of these compounds. An equation is presented which determines the range of activation energies which can be studied by this method.

In the second part of this work the high resolution spectra of the aromatic  $H^1$  and  $F^{19}$  nuclei in numerous symmetric and substituted fluorobenzenes are presented and discussed. Many of the spectra obtained can be explained by a coupling of nuclear spins via an interaction with the electrons in the molecules. Many others are difficult to analyze because of the complications introduced by "chemical shifts" which cause overlap of the spectral lines. The results obtained suggest that the nuclear spin coupling is influenced by the distribution of electrons in the benzene ring: the greater the electron density between interacting nuclei, the greater the coupling. Furthermore, it appears that coupling between aromatic  $H^1$  and  $F^{19}$  nuclei is predominantly via the  $\sigma$ -bonds whereas the coupling between nonequivalent aromatic  $F^{19}$  nuclei is mainly via the  $\pi$ -bonds.

113 pages. \$1.41. Mic 56-57

#### A DETERMINATION OF THE VAPOR PRESSURES OF SULFUR, MERCURIC IODIDE, AND CUPROUS CHLORIDE BY THE TORSION-EFFUSION METHOD

(Publication No. 14,474)

Donald Wallace Magee, Ph.D.  
The Ohio State University, 1955

The vapor pressures of sulfur between  $59^\circ$  and  $95^\circ\text{C.}$ , of mercuric iodide between  $43^\circ$  and  $80^\circ\text{C.}$ , and of cuprous chloride between  $260^\circ$  and  $370^\circ\text{C.}$  were measured by the torsion-effusion method. By combining the torsion-effusion and Knudsen effusion methods, the molecular weight of cuprous chloride vapor at approximately  $360^\circ\text{C.}$  was determined.

The torsion-effusion method involves essentially the measurement of the couple resulting from the recoil of molecules effusing from oppositely directed orifices of an effusion cell suspended from a torsion fiber. The method differs from the Knudsen effusion method in that the equilibrium pressure over the condensed phase can be measured independently of a knowledge of the molecular species present in the vapor.

A torsion-effusion apparatus utilizing resistance heating is described.

The vapor pressure of sulfur was measured with both a brass and a glass effusion cell. The two sets of results are identical within experimental error after correction for orifice-edge thickness. These results are in agreement with the measurements of Taillade and of Foutetier but are higher than those of Neumann by approximately 30 per cent. Alternative explanations are offered for the disagreement with the torsion-effusion results of Neumann.

The vapor-pressure measurements on mercuric iodide, which were performed with the glass effusion cell, are higher than those of Shibata and Niwa, and the two vapor-pressure curves diverge at the higher temperatures.

The glass effusion cell was used also in the vapor-pressure measurements on cuprous chloride. The molecular weight determination of cuprous chloride vapor

gave the value  $306 \pm 21$ . This is additional evidence of the existence of trimeric cuprous chloride.

From the vapor-pressure measurements and other thermodynamic data, expressions for the heats and free energies of sublimation of the three substances are derived.

77 pages. \$1.00. Mic 56-58

#### PART I: THE DISTRIBUTION OF THE POTENTIAL IN A UNIFORM COLUMN OF ELECTROLYTE DURING ELECTROLYSIS AND PART II: THE ANALYSIS OF ACTIVATION OVERPOTENTIAL INTO EXPONENTIALLY DECAYING COMPONENTS

(Publication No. 15,457)

Luther Whitfield Marks III, Ph.D.  
The University of Oklahoma, 1955

##### Part I

In earlier investigations at the University of Oklahoma non-uniform potential gradients along the axis of a uniform column of electrolyte during electrolysis were interpreted as the result of macroscopic space charge. This research has shown that the major cause of these non-uniformities was a non-uniform current distribution over the cross section of the column near the electrodes. Much of this non-uniform current distribution was produced by the passage of a significant fraction of the current around the edges to the back side of the electrodes. Convection effects very near the electrodes, an effect of the atmosphere on the anode reaction near the atmosphere-electrolyte-electrode junction, and variable surface conditions of an electrode also were shown to produce non-uniform current distributions. These four effects were found to account for nearly the entire measurable non-uniform potential gradient along the axis.

##### Part II

In the work described in Part I, the form of the decay curves of overpotentials appeared to be like that of a mixture of two radioactive substances having widely different decay constants. A study of the overpotential decay curves revealed that each would be accurately expressed as the sum of three exponentially decaying components which disappeared respectively in approximately 2.5, 11, and 20 or more minutes. These three components, observed in HCl at Pt electrodes and with several other electrode-solution systems, were interpreted to be components of hydrogen (activation) overpotential. These components were associated with adsorbed layers (states) of the hydronium ion,  $H_3O^+$ , the hydrogen ion,  $H^+$ , and the hydrogen atom, H. The three layers were referred to as adion, adion, and adatom layers respectively.

It was also interpreted that the fastest decaying component of the overpotential disappears as the  $H_3O^+$  adion layer becomes a layer of  $H^+$  adions; that the component that disappears at the intermediate rate does so as the layer of  $H^+$  adions becomes a layer of H adatoms; and that the slowly decaying component disappears as the layer of H adatoms pass by combination into free  $H_2$  molecules.

From experimental observations of these three



consecutive processes, the last "slow combination" reaction was interpreted to be the rate-determining reaction.

It was inferred that the layer of  $H_3O^+$  adions is weakly adsorbed and exists at the greatest distance from the electrode surface; that the most strongly adsorbed layer, the  $H$  adatom layer, exists closest to the electrode; and that the layer of  $H^+$  adions has an intermediate degree of adsorption and lies between the two other layers.

For greater concentrations of the solution a fourth much more slowly decaying process was observed; it was associated with a very strongly adsorbed layer.

It was found also that anode overpotential could be represented as the sum of three exponentially decaying components. 140 pages. \$1.75. Mic 56-59

### A THERMODYNAMIC STUDY OF BIPOLAR IONS IN SOLUTION

(Publication No. 13,804)

Frank Robert Meeks, Ph.D.  
Polytechnic Institute of Brooklyn, 1956

In recognition of the present desirability of information relating to the thermodynamic properties of bipolar ions in solution, an experimental study is made of two simple ions of this class, sebacate and succinate. The activity coefficients of salts of the two anions are measured in order to obtain information concerning the extent of their interactions with other ions and with one another. An interpretative theory, based in part on the experimental results, is presented as a starting-point in the development of a theoretical treatment of the solution properties of more general representatives of the class.

Since the interactions of bipolar ions with one another are ignorable in solutions extremely dilute with respect to the bipolar ions, solubility determinations, using a simple electrochemical cell, are made at  $24.80^\circ\text{C}$  on the slightly soluble disilver sebacate and succinate in aqueous solutions varying from 0.005 to 2.0 in molality of an added electrolyte, sodium nitrate. From the solubility data, mean ionic activity coefficients and solubility-product constants are calculated for the two salts.

Mean ionic activity coefficients are also determined isopiesticly for disodium sebacate and succinate at moderate concentrations in aqueous solution at  $24.80^\circ\text{C}$ . Inasmuch as the isopiestic method yields only relative values for activity coefficients, a mathematical artifice is advanced for the conversion of these relative values to "absolute" values.

A theoretical expression is derived for the activity coefficient of bipolar ions in a solution dilute with respect to the bipolar ions but of any total ionic strength. The basis for the derivation is a "dumb-bell" model, in which the two charges of the bipolar system are considered as being held rigidly in position at a fixed distance from one another. The linear form of the Poisson-Boltzmann relation for the electrostatic potential is solved approximately for such a system, and from this potential the electrical work performed in charging up one molecule of a bipolar ion in a solution of given ionic strength is calculated. The latter value is used to estimate the dependence of the chemical potential on the concentration of ions in the

solution. An expression for the variation in the activity coefficient with concentration is derived from the expression for the chemical potential.

Some of the mathematical properties of this theoretical equation are investigated, and it is applied to the experimental results on the disilver salts and to data from the literature on (a) amino acid and peptide "zwitterions" in ethanol-water solutions containing neutral salts and (b) aqueous solutions of disodium fumarate and maleate. For all these systems, the expression is moderately successful in treating the ratio of activity coefficients of pairs of bipolar ions in the same solvent system. Ratios of pairs of activity coefficients are treated rather than individual activity coefficients because nonideality effects which are not electrostatic in origin usually cancel in such ratios, whereas these effects modify individual activity coefficients in ways for which the theoretical expression does not account.

Finally, the experimental isopiestic results on disodium sebacate and succinate are discussed qualitatively from a thermodynamic viewpoint; a detailed quantitative interpretation of the isopiestic data is an extremely difficult problem and is not attempted, since under the experimental isopiestic conditions the bipolar ions interact very strongly with one another. 127 pages. \$1.59. Mic 56-60

### CRYSTAL GROWTH AND ISOTOPIC EXCHANGE OF LEAD SULFATE IN AQUEOUS MEDIA

(Publication No. 14,993)

Lawrence Barclay Nelson, Ph.D.  
New York University, 1955

Adviser: S. Z. Lewin

The growth of lead sulfate crystals by extractive crystallization has been studied in the following media: water, sulfuric acid solutions up to 8.0 N, acetic acid solutions to 6.0 N, nitric acid solutions to 10.0 N, perchloric acid solutions to 6.0 N, mixed acids, and nitric and sulfuric acid solutions containing added salts. In every case the crystals grown from acid solutions are larger than those grown from water, regardless of the solubility of  $PbSO_4$  in the medium. The maximum crystal size is found to occur at intermediate acid concentrations, with decreased size at both smaller and larger concentrations.

The effect of aging on a lead sulfate precipitate has been shown to lead to geometrically larger particles from acid solutions than from water, again independently of the solubility. However, the aged crystals show an increased apparent surface area as measured by dye adsorption.

The specific effect of hydronium ions in promoting crystal growth, previously observed for  $SrSO_4$  and  $PbCl_2$ , and now demonstrated for  $PbSO_4$  and  $BaSO_4$ , may be a general phenomenon in the crystal growth of sparingly soluble substances. A mechanism is proposed for the crystal growth of lead sulfate that is based upon the addition of  $SO_4^{2-}$  to the crystal surface as the rate-determining step.

The exchange of lead sulfate with its ions has been investigated in saturated solutions of lead sulfate in nitric, perchloric and sulfuric acids for periods up to 120 hours at  $25.00 \pm 0.01^\circ\text{C}$ .

The lead sulfate specimens studied consisted of (a) crystals grown by homogeneous precipitation from concentrated sulfuric acid, (b) ground crystals, (c) precipitated crystals, and (d) precipitates aged in water and in nitric acid solutions.

It is considered that neither diffusion from the bulk of solution to the solution-crystal interface, nor recrystallization of the solid phase are significant factors in determining the kinetics of the present measurements. Therefore, the rate-controlling steps are either diffusion across the solution-solid interface, surface exchange, and/or diffusion into the solid.

The data allow us to distinguish two processes, a rapid one that is complete in less than an hour and that involves exchange or adsorption equivalent to a fraction or several apparent monolayers, depending upon the medium; and a slow process that is not complete after many hours, and that may involve several hundred apparent monolayers.

The rate equation for the first two possibilities is:

$$-Rt = \frac{A B}{A + B} \ln (1-F)$$

and application of this expression to the  $\text{SO}_4^{=}$  exchange data suggests that less than the whole solid is effective in the exchange. The data have led to an estimate that the mass of the solid that is effective in the exchange consists of several hundred apparent monolayers. The  $\text{Pb}^{++}$  and  $\text{SO}_4^{=}$  exchange rates have been calculated for several assumed values of this effective mass.

The main features of the present data may be summarized as follows: (1) the  $\text{Pb}^{++}$  exchanges are all linear with time up to at least 120 hours; (2) the  $\text{SO}_4^{=}$  exchanges are all initially much faster than the corresponding  $\text{Pb}^{++}$  exchanges, and after a number of hours become much slower; (3) the exchange rates vary markedly as the concentration and the nature of the electrolyte in the solution phase is varied; (4) the  $\text{Pb}^{++}$  and  $\text{SO}_4^{=}$  exchange rates are affected differently by variations in the medium or in the specific surface areas and the degree of aging of the crystals; (5) the  $\text{Pb}^{++}$  exchange rate is markedly diminished in  $\text{H}_2\text{SO}_4$  solutions (the  $\text{SO}_4^{=}$  exchanges were not measured in  $\text{H}_2\text{SO}_4$  solutions).

It is suggested that the rates of the  $\text{Pb}^{++}$  exchanges and the initial rates for the  $\text{SO}_4^{=}$  exchanges are determined by the diffusion of the tracer across the solution-solid interface and/or by the surface exchange process. The rate of exchange of  $\text{SO}_4^{=}$  in every instance is more than an order of magnitude greater than the rate of exchange of  $\text{Pb}^{++}$  in the same solution and this is interpreted as due to a small, but definite, positive charge on the crystal surface which results in a lower energy barrier for the  $\text{SO}_4^{=}$  exchange than for the  $\text{Pb}^{++}$  exchange. The specific exchange rate constant for the  $\text{Pb}^{++}$  exchange in  $\text{H}_2\text{SO}_4$  is more than an order of magnitude smaller than in nitric or perchloric acid solutions and this is probably a consequence of the pronounced adsorption of ions and molecules in concentrated  $\text{H}_2\text{SO}_4$  solutions which leads to a slower rate of diffusion of  $\text{Pb}^{++}$  ions across the solution-solid interface than in the case for  $\text{HNO}_3$  or  $\text{HClO}_4$  solutions.

The exchange studies also indicate that gentle grinding of the crystals led to a greater surface perfection, i.e., to a decreased thickness and diffusion coefficient of the Schottky layer. This is explained as due to preferential fracturing along faults and imperfections.

The exchange data suggest that the principal effect of

aging in solution has been to alter slightly the magnitude of the small surface charge acquired by the solid in the exchange medium. Aging in water appears to have decreased the positive surface charge somewhat; aging in 5 N  $\text{HNO}_3$  may have increased it slightly.

120 pages. \$1.50. Mic 56-61

#### INHIBITION OF IRON DISSOLUTION IN ACID SOLUTIONS WITH DEPOLARIZERS

(Publication No. 14,995)

Eric Rau, Ph.D.  
New York University, 1955

Adviser: C. V. King

It has been shown that the dissolution of iron cylinders rotating at a peripheral speed of fifteen thousand centimeters per minute can be inhibited by the addition of various reagents to the corroding solution of 0.02 M hydrochloric acid and 0.06 M potassium nitrate.

A number of oxidizing agents were shown to reduce corrosion markedly. Potassium dichromate was especially effective when promoted with chelating agents. On the other hand if 0.02 M perchloric acid and 0.06 M potassium nitrate were used as the corroding solution potassium dichromate was much more effective alone, complexing agents reducing the protection time. These differences can be interpreted in terms of peptization of the film by chloride ion and oxide solubilization by the chelants.

The potential of the iron cylinder was measured in various corroding and inhibited solutions. The weight loss data in conjunction with the potentials were interpreted on the basis of the generalized film theory.

Neocupferron was shown to be a satisfactory inhibitor without addition of an oxidizing agent. Protection by this reagent was obtained if its concentration was above a critical value determined by the volume of the solution used. An insoluble compound forms which adheres to the cylinder forming a film. In air the chelate is oxidized to give a porous oxide film. If the pores are clogged with chelate then excellent inhibition is obtained. Since neocupferron is sensitive to oxygen it must be renewed if long term inhibition is desired. In deaerated solution the film consists of only chelate. The film thickens according to a parabolic growth law. From this and other experiments a mechanism has been proposed depending on initial dissolution of iron before a chelate coating can form.

Carbon monoxide also inhibits well. Protection does not seem to depend on acid concentration. The mechanism here apparently involves adsorption.

63 pages. \$1.00. Mic 56-62



PART I. THE PHOTOCHEMICAL AND THERMAL  
DECOMPOSITION OF TRIMETHYLENE OXIDE.  
PART II. LEWIS ACID-BASE TITRATIONS.

(Publication No. 15,161)

Jay G. Rutgers, Ph.D.  
Northwestern University, 1955

Part I

The photochemical decomposition of trimethylene oxide has been investigated in the temperature range of 25-100°C at a pressure of 200 mm. The decomposition products identified were ethylene, formaldehyde, small amounts of carbon monoxide and hydrogen, and traces of ethane and methane. A reasonable material balance was obtained between ethylene and the sum of formaldehyde and carbon monoxide, indicating that the primary step is the formation of ethylene and formaldehyde, either through the intermediate formation of a biradical, or through an intramolecular decomposition, and that most of the carbon monoxide is formed from the secondary photolysis of formaldehyde. There is an indication that the primary step may proceed by way of an intramolecular decomposition since an increase in temperature has very little effect on the rate of decomposition.

The thermal decomposition of trimethylene oxide has been investigated in the temperature range of 250-350°C and the pressure range of 350-440 mm. The major products obtained from the thermal decomposition are ethylene and formaldehyde in addition to carbon monoxide, hydrogen, and small amounts of ethane. The analyses of products indicate that the primary step is a decomposition into ethylene and formaldehyde followed by a decomposition of formaldehyde into carbon monoxide and hydrogen.

Part II

A number of amines have been titrated successfully with boron trifluoride in dioxane using a high frequency end point detection method. The number of amines which may be titrated by this method is limited because of the basicity of the solvent. Pyridine was the weakest amine titrated by this method. Aniline did not yield an end point. A gas titration method based upon a measurement of the volume of boron trifluoride gas absorbed by a benzene solution of the sample, was developed. Chemical indicators were used to detect the end point. This titration procedure made possible the titration of aniline when methyl violet was used as the indicator. No weaker amines could be titrated because suitable indicators were not available.

In an attempt to extend the range of Lewis bases which might be titrated, a gas absorption method was developed. By this method ethers and ketones could be determined, but the method was proved to be too slow to be of significant practical value.

91 pages. \$1.14. Mic 56-63

CHARACTERISTIC INTEGRATED INTENSITIES OF  
BANDS IN THE INFRARED SPECTRA  
OF CARBOXYLIC ACIDS

(Publication No. 15,312)

Joseph Wenograd, Ph.D.  
University of Maryland, 1955

Supervisor: Associate Professor Robert A. Spurr

The integrated intensities of the free and bonded hydroxyl and carbonyl stretching bands in the spectra of carboxylic acids were measured and found to be characteristic properties of a series of acids. These bands were all more intense in acids in which the carbonyl function was part of a conjugated system. In all cases there was an increase in intensity when the absorbing group was hydrogen-bonded.

The integrated intensities of the free hydroxyl bands were 1.2 intensity units for non-conjugated acids and 1.7 intensity units for acids in which the carbonyl function was part of an aromatic or dienoid system. The corresponding intensities of the associated hydroxyl bands were 10.6 and 15.5 intensity units. The integrated intensities of the free carbonyl stretching bands were near 3.6 and 4.6 intensity units for the two types of acids. The intensities of the associated carbonyl bands were 4.5 and 5.9 units respectively. Each carbon-hydrogen bond in the acids studied absorbed with an intensity of about 0.46 units in the neighborhood of 3000  $\text{cm}^{-1}$ .

The equilibrium constants for the dimerization of several acids in  $\text{CCl}_4$  were determined by studying the variation of the intensity of the free hydroxyl band with concentration. These dissociation constants were near  $4.5 \times 10^{-4}$  moles/liter for the non-conjugated acids, and seemed to increase with the size of the acid molecule. The constants were about  $2.2 \times 10^{-4}$  moles/liter for the conjugated acids.

Dissociation constants of several acids were determined by studying their distribution between water and  $\text{CCl}_4$ . The constants obtained by this method did not agree with the spectroscopic values, and it was concluded that distribution values do not apply to the association of acids in dry solvents.

108 pages. \$1.35. Mic 56-64

## ECONOMICS

### ECONOMICS, GENERAL

#### STATE DISABILITY INSURANCE, A STUDY OF TWO MAJOR ISSUES

(Publication No. 14,773)

Robert Gordon Menefee, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Edwin E. Witte

In 1942 Rhode Island inaugurated a social insurance program designed to replace part of the wage loss arising from temporary non-occupational disability. Since then temporary disability insurance laws have been passed by California, New Jersey, and New York, and a similar system set up by Federal law for railroad workers. Establishment of these programs brought into compulsory disability insurance coverage approximately one-fifth as many workers as are protected by unemployment insurance. At the same time it sparked widespread controversy regarding the need for and the features to be included in state disability insurance.

This study examines two major issues around which controversy has centered: (1) Is existing voluntary protection adequate or nearing adequacy? (2) Should a compulsory system of disability insurance operate through private insurance, either in whole or in part? Both of these questions have been extensively debated in states considering the establishment of disability insurance programs.

As background for the analysis of these issues, Part I presents selected data on the extent and nature of disability, traces recent legislative activity in this field and summarizes the provisions of the four existing state laws. Part II then examines the extent and nature of existing voluntary protection. The bulk of data for this examination were drawn from surveys conducted by ten states when disability insurance bills were under consideration in their legislatures. These data, supplemented by others from the insurance industry, indicate with respect to voluntary protection against wage-loss that: (1) such protection has expanded rapidly in recent years and may reach as many as two-thirds of the industrial workers in some states but fewer than one-third in others; (2) the rate of expansion has declined and further extension will be relatively slower; and (3) the protection provided is uneven in quality and for many of the "covered" workers is very limited.

In Part III is examined the question whether a compulsory disability compensation program should be entirely state-operated or operate more or less through private insurance. This issue is well posed by the existing programs since Rhode Island has an exclusive state fund, California and New Jersey provide for coverage by a state fund but permit "contracting-out," and New York requires each employer to provide disability protection for his workers, the state fund serving simply as a competing carrier.

The analysis attempts to sift from the opposing arguments those which have an empirical content and to examine these objectively. Emphasis throughout is placed upon the implications for this issue of the operating experience in Rhode Island, California, New Jersey, and New York. The conclusions drawn are recognized as tentative, for the data are often incomplete even though extensive.

From the facts presented, certain generalizations emerged. With private plans as an integral part of a state program, considerable variation results in both benefits and contributions. Generally the private plans have covered the more favorable risks and offered more generous benefits. Progressive statutory liberalization in California and New Jersey have brought a decline in private plan coverage, and have raised state plan benefits relative to private plans. As a result, those state plans, like Rhode Island's, have paid total benefits roughly equal to contributions in recent years.

Except in Rhode Island, disability among the unemployed poses a special coverage problem and has necessitated special provisions. Additional complexities have been introduced by the need for examining and supervising private plans. 512 pages. \$6.40. Mic 56-65

#### DU PONT: A STUDY IN FIRM GROWTH

(Publication No. 14,981)

Willard Fritz Mueller, Ph.D.  
Vanderbilt University, 1955

Adviser: Dr. George W. Stocking

Professor Wassily Leontief recently remarked that "the task of filling the 'empty boxes of economic theory' with relevant empirical content becomes every day more urgent and challenging." Among these empty or partially filled boxes of economic theory are a growing number on the shelf labeled "explanations of the growth of big business." This study was undertaken in the hope of providing some empirical content for these boxes as well as to seek out new hypotheses explaining the firm growth process.

Du Pont's growth and transformation from a small single-product firm in 1803 to one of the world's largest industrial conglomerates provides an unusual opportunity to fulfill the above tasks because currently there is a vast amount of relevant information available on its operations.

The factors causing and conditioning Du Pont's growth have been complex and polymorphic. This study, however, has dealt most specifically with the roles of wars, mergers, technology, and market power in Du Pont's growth. The analysis is divided into two parts: (1) Du Pont's growth from a small single product gunpowder firm in 1803 into the country's largest diversified explosives concern a



hundred years later; and (2) Du Pont's transformation since 1910 into the world's largest chemical concern.

Part I, essentially a historical treatment of Du Pont's growth, covers two periods: its founding and growth through the Civil War as a maker of gunpowder (Chapter 2); and its rise to power as head of the "Powder Trust" and its diversification into other lines of explosives during the next forty years (Chapters 3 and 4).

Part II is concerned, first, with the process by which Du Pont became a diversified chemical concern and the motives and methods involved in this transformation (Chapter 5); second, with Du Pont's entry and growth in four important products (Chapters 6 and 7), and its growth in international markets (Chapter 8); third, with the role of three specific factors in Du Pont's growth: mergers (Chapter 9), technology (Chapter 10), market power and absolute size (Chapter 11); and finally, with a summary of the major factors explaining Du Pont's unique growth (Chapter 12). The major findings of this study follow.

Du Pont's successful growth from 1803 to the end of the Civil War can be attributed largely to its superior managerial and productive efficiency. The War of 1812 was of substantial short-run importance to Du Pont's early growth: during it Du Pont experienced the most rapid period of growth of its history. But its long-run effects were less spectacular. Because Du Pont's growth in the decades following the war was conditioned largely by the size of its market, it had to retrench in the postwar years.

Du Pont's growth and transformation into a fully diversified explosives maker during the half century following the Civil War was predicated upon acquisitions. It grew in gunpowder largely by acquiring rivals. It entered and grew in high explosives, smokeless powder, and blasting supplies in the same way. It not only acquired rivals to expand its position in these markets, but by purchasing them it got most of the important technology needed to enter and grow in these new fields. Although before the Civil War Du Pont had maintained the initiative in advancing technology, available evidence suggests that thereafter it lost it. Although it had regained this initiative after 1900, it had done so primarily by acquiring technology developed in every important field of explosives by others.

Du Pont's transformation into a diversified chemical company involved a complex variety of factors. But the role of Du Pont management is clearly distinctive. In one sense most of Du Pont's unique growth may be explained by the foresight, ingenuity, and aggressiveness of Du Pont management in looking for, recognizing, and exploiting new growth opportunities.

Another identifiable factor contributing to Du Pont's unique growth during this period was World War I. Du Pont's peculiar ability to benefit from the insatiable powder demands of war, provided it with tremendous earnings with which it could diversify. Especially important to its future growth was the wise decision of its management to invest about half of its retained earnings in General Motors common stock beginning in 1917. The stream of earnings from this investment proved phenomenal. During the 1920's it was as great as Du Pont's total net earnings from all its other investments; and by 1953, Du Pont had received dividends of almost a billion dollars from this source. This was over a third of Du Pont's total net earnings from all sources between 1920 and 1953.

Du Pont's extensive use of mergers as a growth method accelerated its growth. The record indicates a high

correlation between Du Pont's rates of growth and its rate of mergers during various periods. Other evidence indicates that a causal relationship underlies this correlation. Moreover, mergers not only accelerated Du Pont's short-run growth, but its long-run growth as well, for they often proved the most effective — and in some cases the only — way of entering relatively young and dynamic industries.

Du Pont has grown successfully and rapidly since World War I, in large part, because it was an innovator. It followed a deliberate policy aimed toward this end. It selected fields where it could make a unique contribution. It introduced new products, increased their demand by improving their quality, and lowered their cost by developing improved production processes. Between 1920 and 1949 it made numerous important innovations. Analysis of twenty-five of the most important of these indicates that most of its successful innovations rested primarily upon the basic technology it acquired from others. Much of this "borrowed" technology came from abroad. The rest was acquired from domestic concerns directly or by purchasing concerns owning it.

While bigness is a result of successful growth, this study indicates that with Du Pont it played a causal role as well. Once Du Pont became a large diversified concern, it was able to subsidize losses in one line of business or in one market out of its earnings in other lines or areas. Its large size and diversification also gave it definite growth advantages over smaller and less diversified rivals because as a large buyer it was able to increase the demand for some of its products by urging its suppliers to buy from it. Because Du Pont was the country's largest chemical firm for most of the period since World War I, many of the world's other large chemical concerns courted its favor and it theirs. The reciprocal favors exchanged between Du Pont and the world's other leading concerns affected its growth in several ways. At times its rivals avoided technological competition with Du Pont. At other times they exchanged technology with Du Pont. In these ways, Du Pont's large size at times gave it partial immunity from the "perennial gale of creative destruction" which works to undermine innovators profits, and at other times gave it access to important technology underlying important innovations. 468 pages. \$5.85. Mic 56-66

## ECONOMICS, COMMERCE — BUSINESS

### THE ECONOMICS OF THE EVAPORATIVE COOLER INDUSTRY IN THE SOUTHWESTERN UNITED STATES

(Publication No. 15,369)

Arthur William Gutenberg, Ph.D.  
Stanford University, 1955

In many parts of the southern and western United States cooling interior spaces in the Summer is as important as heating them in the Winter. Direct comfort cooling can be achieved by several processes including the evaporation of water. Historians have shown that evaporative cooling was used by the peoples of the world's ancient civilizations. Its



current usage is an outgrowth of the homemade coolers of 30 years ago.

The effectiveness of evaporative cooling is related to the humidity of the air and is restricted to geographical areas where the summer-time wet-bulb depression is large.

Since the evaporative cooler's effectiveness is determined by prevailing weather conditions, its operating characteristics will not always meet maximum human comfort requirements. Hence, competition between this cooling device and mechanical refrigeration for consumer acceptance is directed along cost lines. Evaporative cooler manufacturers concentrate on reducing and maintaining all costs at a minimum as is evidenced by the simple design of the product, tightly controlled management, rudimentary distribution channels, and inter-company competitive practices.

Approximately 90 percent of all evaporative cooler sales are to customers located in southern Arizona, central and southern California, southeastern corner of Colorado, Kansas, southern Nevada, southern New Mexico, Oklahoma, the interior areas of Oregon, western Texas, eastern Washington, and some areas in Utah. In the past the Arizona-California area consumed most of these coolers. As of 1954 cooler demand in this region is becoming saturated while increased incomes and rural electrification in the Kansas-Oklahoma-Texas area are providing a large market for these devices. Small amounts of coolers are sold to users in all of the other states of the Union. About two percent of the annual production is exported to Central and South America, the Middle and Far East, and to Africa.

A survey, in 1953, of evaporative cooler manufacturers revealed that most of the firms contacted and currently building coolers are located either in Los Angeles, California, or Phoenix, Arizona. The former group produces other products, mostly space heaters, cooking stoves and similar items, while the latter group is largely classed as single-product manufacturers. Most of the firms currently classed as multi-product manufacturers have taken on other product lines as a means of providing protection against seasonal instability. Usually the organizations are of recent origin with the founding management still at the helm of the enterprise.

The product can be built in a variety of ways. The desert or drip type model is generally favored because it is easily built, requires few special or expensive parts, is easily installed, and needs little maintenance. Furthermore, the operating costs of this type of cooler are low.

Since many families cannot afford refrigerated air conditioning, and climatic conditions are adequate, evaporative cooling enjoys a large market in the Southwest today.

Developing in an area where only little industry existed the evaporative cooler industry provided economic stability by broadening the region's economic base. As a result of evaporative cooler use, employment in the construction industry has been increased producing ducts and installing coolers. Limited employment has also been provided in the manufacture of aspen excelsior pads which are used in the cooler.

The evaporative cooler industry is now reaching maturity. Whereas its past growth has been rapid and limited only by manufacturing capacity, future expansion should be more closely related to the building industry,

income patterns in the American Southwest and the development of new space cooling techniques.

285 pages. \$3.56. Mic 56-67

## ECONOMICS, FINANCE

### LIFE INSURANCE STOCKS AS INVESTMENTS

(Publication No. 15,381)

James Temple Starke Porterfield, Ph.D.  
Stanford University, 1955

The purpose of this study is to analyze the characteristics, performance and prospects of life insurance stocks as a class of equity investment. In the past, these stocks have received extremely little attention from students of investments, reflecting their relatively limited supply, the unusual nature of the life insurance business, and the predominance of mutual companies in the industry. The study is restricted to a treatment of life insurance stocks as a class and makes no attempt to analyze individual issues.

Six chapters are devoted to an appraisal of the life insurance industry as a vehicle for equity investment. Such major factors as the growth of the industry, its stability, economic characteristics, mortality experience, reaction to war and inflation, ability to control expenses, competition from other agencies, and investment problems and regulation are considered in detail from the viewpoint of their effect on life insurance stocks as equity investments.

Life insurance companies do not report earnings as such, and hence analysis of life insurance stocks suffers in that the various factors considered cannot readily be related to earnings, perhaps the key criterion of investment value. In order to surmount this difficulty, an estimate of aggregate indicated earnings of twenty large stock life insurance companies is constructed by computing and adjusting annual changes in surplus. These indicated earnings are then related to some of the principal factors mentioned above.

The historical market performance of life insurance stocks as a class is measured by constructing indexes of prices and yields for a sample of these shares. Covering the years 1929-1954, these indexes are compared with certain price and yield indexes published by Standard & Poor's Corporation.

The final chapter presents the conclusions of the study. The life insurance industry has grown impressively in the past, and prospects are favorable for continued growth. Indicated earnings have shared in this growth. However, the latter have not reflected the industry's stability in other respects, owing to the leverage imparted by low profit margins and large policy liabilities. Mortality experience has improved steadily, and the outlook is for further improvement. The industry is relatively well situated to withstand the effects of all but the most severe periods of inflation. Past wars and competition from governmental life insurance equivalents have thus far failed seriously to impede the growth of life insurance in this country. However, the possibilities of a future conflict with atomic weapons and of governmental security programs so



expanded as to preempt largely the market for private insurance remain principal uncertainties in the longer term outlook for the industry as an investment medium. The latter's record of expense control is good, and continued progress in this function is indicated. The nature of the life insurance business combines with legal regulation to require the investment of funds in a conservative manner.

Life insurance stocks have enjoyed remarkable price appreciation, far outstripping the general market and other financial shares, especially in recent years. They have also performed relatively well in periods of war and inflation. However, they have displayed no unusual price stability in periods of depression. Yields on life insurance stocks have typically been extremely low compared with common stocks in general. 412 pages. \$5.15. Mic 56-68

## ECONOMICS, THEORY

### THE INTEREST RATE IN WELFARE THEORY

(Publication No. 15,131)

Edwin Walter Hanczaryk, Ph.D.  
Northwestern University, 1955

Changes in the interest rate affect social welfare in many ways. The following functions of the rate suggest a multiplicity of relationships: (1) the interest rate "allocates" capital funds among firms; (2) it is a determinant of the rate of capital formation; (3) it exerts an important influence on the cycle; and (4) it is one of the functional shares and, hence, a determinant of both the functional and the personal income distributions.

Though a complete analysis of the relation of the interest rate to welfare should take into account all functions of the rate, such a complete analysis has never been attempted. The present study constitutes such an attempt, for it consists of a critical analysis of the writings of various groups, each of which emphasized different aspects of the relationship and it integrates their contributions into a coherent whole. The various groups are: (1) the classical economists; (2) the neo-classical economists; (3) the new welfare economists; and (4) modern business cycle theorists.

The classical economists, who envisaged an expanding free-enterprise economy and aimed at a maximum average physical output for the largest class, the laboring class, stressed the interest rate in relation to capital formation as one of the chief means of increasing physical output. Since capital formation required saving, saving became the essential determinant of welfare.

The neo-classical and new welfare economists both worked within the framework of a stationary state, but whereas most neo-classicists were equalitarians by virtue of their goal of maximum aggregate satisfactions in society and their assumption of equal abilities to enjoy income, the new welfare economists abstracted from distributional considerations.

The new welfare economists emphasized the importance of time preference which the neo-classical school had disregarded. They classified the choices open to an individual

with spending power into five categories: (A) purchase of goods and services for immediate consumption; (B) purchase of durable consumers' goods; (C) acquisition of fixed productive assets; (D) purchase of stocks, bonds, and promissory notes; and (E) holding cash balances to satisfy the transactions motive, that is, to enable the individual to meet payments without default or delay. Individual equilibrium was then described thus: the individual maximizes his satisfactions, given his income and given the current market prices, when the marginal additions to present satisfactions resulting from an added dollar's expenditure on each of the five categories of choice are all equal. Where the marginal increments are streams of future satisfactions, these must be discounted to the present at the individual's rate of time preference. In the case of cash balances, the marginal addition to satisfactions is Walras' *utilité d'approvisionnement* and the price of the cash balance is the interest foregone. Thus, in stationary equilibrium each individual must discount future satisfactions at the market rate of interest and aggregate savings must equal amortization charges. In a progressive state, individuals again save when their rates of time preference are smaller than the rate of interest, but now society's savings exceed amortization charges. For society, savings are optimal only in the sense that each individual freely decides on the magnitude of his savings. Different income distributions would probably lead to different amounts of savings.

Business cycle theorists consider such goals as full employment and they neglect time preference. They stress the influence of the interest rate on the cycle and generally agree that since much investment is interest-inelastic and uncertainty premiums are large for long-term investments, interest policy is more powerful in slowing a boom than in promoting recovery.

Statistical studies of the effect of changes in the interest-rate on the distribution of personal income are inconclusive. The redistributive effects of a change in the rate are probably small. 177 pages. \$2.21. Mic 56-69

### THE EPISTEMOLOGICAL AND METHODOLOGICAL CHARACTER OF INTERPERSONAL UTILITY COMPARISONS

(Publication No. 15,133)

Svend Olaf Hermansen, Ph.D.  
Northwestern University, 1955

This dissertation is to be viewed as a contribution to the perennial discussion of the problem of the interpersonal comparability of utility.

To the utilitarians, utility was a cardinal entity which was, at least in principle, measurable and additive. Not only could different pleasures experienced by one individual be added but it was considered possible to add the pleasures experienced by all individuals in a given society.

The assumption of measurability and of interpersonal comparability of utilities was by no means left unchallenged in the nineteenth and early twentieth centuries. However, until 1938 most economists retained it. In value theory utility was considered to be a feeling known from introspection and directly measurable. In welfare economics

interpersonal comparability of utilities was assumed in addition to the measurability of individual utilities.

In 1938 Lionel Robbins maintained that interpersonal comparisons could not be performed empirically but required a value judgment. Robbins' point of view has been accepted practically unanimously by welfare economists. His article has cast a warning shadow on all discussions involving interpersonal comparisons of utility. It has proved to be a "conversation stopper." The view that it is just as futile to discuss whether slum dwellers are less happy than people living in the suburbs as to discuss which tastes better, blue cheese or Swiss cheese is today generally accepted by economists. There is a lack of serious controversy on this point.

It is the contention of this paper that interpersonal comparisons of happiness do not require the introduction of a value judgment but can be made on empirical grounds. Economists are lone wolves in the epistemological woods when they assert that the nature of interpersonal comparisons of happiness are value judgments. Psychologists have no reservations about making them on empirical grounds.

However, if we want to develop a welfare economics involving interpersonal comparisons of utility we must liberate ourselves from the utilitarian and the Old Welfare tradition. A blanket assertion that interpersonal comparisons of utility can be made will lead us nowhere. We must follow the same path that the other empirical sciences, notably physics, have trod so successfully. In order to rid ourselves of the vagueness and ambiguity attached to the expression "happier than" a decision must be made as to which of the many meanings of this expression we are interested in. An operational definition of this version of "happiness" must be constructed such that we know exactly what empirical data to collect in order to decide whether the proposition "A is happier than B" is a true statement.

No attempt has been made in this dissertation to devise a method for measuring utility under specified circumstances; this is a job for psychologists, and a tough one. The author is satisfied if he succeeds in convincing the reader that the problems involved in the measurement of utility are of the same kind as those which were encountered when methods of measurement of such phenomena as temperature, weight, and intelligence were invented.

Though we do not yet have a happiness test we may well on the basis of the prescientific knowledge we possess about the interrelation between economic variables and happiness be able to decide whether one individual is happier than another and even whether one group of persons generally speaking is happier than another group. If we in a practical situation fail to arrive at conclusive results due to the scantiness and vagueness of our prescientific knowledge the very discussion of the case as an empirical problem makes sense. 154 pages. \$1.93. Mic 56-70

#### CAPITAL AND INTEREST IN A GROWING ECONOMY

(Publication No. 15,382)

John Henry Power, Ph.D.  
Stanford University, 1955

This study re-examines the modern theories of interest and capital formation and attempts to fit them into the

framework of a theory of growth. We postulate a given rate of growth of the "free labor supply" (the rate at which free labor is made available through population growth and rising productivity).

The requirements for balanced growth are: (1) capital widening must be at the "warranted" rate — that is, all increments to the labor supply must be equipped in the optimum (i.e., most profitable) ratio of capital to labor; (2) given capital widening at the warranted rate, the optimum capital-labor ratio and the saving function must be such that investment equals full-employment saving. If investment falls short of full-employment saving the economy will tend toward chronic depression in the absence of a rise in the optimum capital-labor ratio or a fall in the saving function.

The possibility that chronic depression would be corrected by automatic adjustments in the saving function via changes in the general price level, as envisaged in recent modified versions of neoclassical theory, depends on the assumption of absence of money illusion. This assumption hinges on individuals' believing with a high degree of certainty that each price variation means a permanent change in the real value of wealth. Such expectations imply unidirectional price movements; but a growing economy is likely to exhibit cyclical movements in prices. Furthermore, the fact that these movements will be quite unpredictable means that expectations will be held with considerable uncertainty.

An essential property of money is stability in its value. The existence of a money exchange economy, therefore, pre-supposes enough long-run price stability to warrant expectations that at least some short-run price movements might later be reversed. This provides the justification for rejecting absence of money illusion and assuming instead that individuals calculate primarily in money terms.

This means that we cannot rely on automatically equilibrating adjustments of the saving function to insure balanced growth. Rejection of the assumption of absence of money illusion also rules out a purely real theory of interest. Interest is partly a monetary phenomenon and monetary policy can, within limits, influence interest rates.

When we place the Keynesian theory of capital formation in a context of growth we must differentiate between capital widening and changing capital intensity. There may be some natural tendency for the rate of capital widening to approximate the warranted rate in the long run. In this case the role of the level of interest rates lies primarily in influencing capital intensity.

In the case of chronic depression there is no tendency for the capital-labor ratio to adjust automatically in an equilibrating fashion. For the failure of the free labor supply to grow rapidly enough to warrant a rate of capital widening equal to full-employment saving results not in a shortage of labor, but in unemployment. Thus, there is little likelihood of a rise in real wage rates as an inducement to adopt labor-saving techniques. And, in a situation of underemployment, monetary policy — instead of the real forces — determines interest rates; hence, there is no "natural" automatic movement of interest rates to induce an equilibrating adjustment in capital intensity.

The principal conclusion of this study is that automatic market forces are too weak to warrant reliance on them in lieu of a positive social policy to achieve balanced growth. 96 pages. \$1.20. Mic 56-71



## TRANSPORTATION AND VALUE THEORY

(Publication No. 15,440)

George Wilton Wilson, Ph.D.  
Cornell University, 1955

This study deals with the impact upon value theory of considerations of distance as well as the ability of value theory, as typically presented, to offer valid and reasonable explanations of the pricing policies of transportation enterprises in general and railroads and motor carriers in particular.

The procedure adopted with respect to the latter problem involved an analysis of the nature and economic consequences of the two major pricing policies of motor and rail carriers, namely, value of service and cost of service. The influence of consideration of costs of abridging distance upon (1) the supply (or cost) and demand schedules facing the individual, non-transportation firm, (2) market supply and demand schedules and (3) competition in general, was specifically examined.

As a result of the analysis it was concluded that:

- (1) Transportation agencies supply homogeneous ton-miles of service.
- (2) Costs of abridging distance shift supply and demand schedules to the left, render them more elastic (given increasing carrier returns which permit tapering rates) and "stepped" in appearance rather than continuous, and also the very fact of freight costs is sufficient to create monopolistic competition.
- (3) The economic meaning of value of service pricing indicates that it is a species of price discrimination based upon the existence of "product surpluses" (analogous to Marshall's consumers' surplus) which the carrier attempts to absorb and hence is analogous to "what-the-traffic-will-bear."

- (4) In its legal conception, value of service pricing, as interpreted by the I. C. C. and the courts means charging "what-the-traffic-will-reasonably-bear" where the adverb "reasonably" refers to the public interest as outlined in the Transportation Act of 1940 and which is construed in the present context as anything in transportation which augments the real G.N.P.
- (5) Railroads are subject to increasing returns.
- (6) The economists' confusion over the precise theoretical meaning of marginal cost (i.e. whether referring to the average variable cost of the extra output where the extra output involves more than one of the basic units or the extra cost of producing one more unit) has significant implications for I. C. C. rate policy.
- (7) Inter-carrier competition will have a strong tendency to become cutthroat due to the nature of the "inducement to transport" which renders the demand for transportation service in the aggregate freight rate inelastic.
- (8) Application of value of service pricing where overhead costs are negligible will lead to excess profits if competition is lacking or loss of business if competition is prevalent. This is borne out by an analysis of motor common carriers.
- (9) Inherent advantages as between motor and rail carriers will be preserved on competitive traffic if a rate structure based upon the average total cost of the low average total cost carrier is adopted.

The general conclusion is that value theory is capable of shedding light upon the economics of rate-making if certain reformulations are undertaken and that the neglect of a distance (or transportation) factor in the theory of the firm renders the theory more unrealistic than need be.

220 pages. \$2.75. Mic 56-72

## EDUCATION

### EDUCATION, GENERAL

#### THE TEMPORAL ORIENTATION OF THE JUVENILE DELINQUENT

(Publication No. 15,443)

Harry William Allison, Jr., Ph.D.  
The University of Oklahoma, 1955

This study was designed to investigate the temporal orientation of juvenile delinquents, those customarily characterized as impulsive individuals. The theoretical assumption upon which this study is based is that the manner of parental administration of punishment and reward is the primary determinant of impulsive, anti-social behavior. With children who later become delinquent, parental administration of reward and punishment is frequently inconsistent and inappropriate. As a consequence, it could logically be expected that these children would be especially prone to seek immediate gratification of their impulses rather than to renounce present pleasure for future gain.

It was hypothesized that the temporal orientation of the delinquents would be of shorter duration than that of the non-delinquents and would be directed primarily toward the present. It was predicted that the delinquents would be less able to relate about the past and the future than would the non-delinquents and that the delinquents would be less able to relate about the past and future than about the present. A difference in temporal orientation was expected between the least and most severe delinquents. Finally, it was predicted that variance in temporal orientation between the groups would not merely be a function of social class affiliation.

Twenty-one non-delinquents were matched with an equal number of delinquents in terms of age, I.Q., and social class. An equal number of subjects in each group came from a middle and low social class. Each subject told five stories, the first of which was given in response to the statement, "Tell me a story." The remaining four stories were given in response to four Thematic Apperception Test pictures. The subjects were questioned about the stories given on the last two pictures as to the past events, present action, and future outcome. Each subject was asked to classify each of the five stories according to whether the action of the story occurred in the past, present, or future. They also estimated the time span of the action in each story. Temporal orientation was statistically assessed from these measures.

As predicted, the temporal orientation of the delinquents was directed toward the present while the non-delinquent orientation was directed more toward the future. Delinquents more frequently told stories in which the span of action was less than one hour while non-delinquents told stories in which the span of action was over fourteen days and often many years in the future. Delinquents were less able to relate about the past and future than the non-delinquents even though urged to do so by direct questioning. Unlike the non-delinquents who related about the past,

present, and future in equal proportion, the delinquents were less able to relate about the past and future than about the present. The temporal differences between the two groups were not found to be accounted for on the basis of social class affiliation. No temporal orientation difference occurred between the most and least severe delinquents.

From these results, it would seem that there are major differences in the temporal orientation of delinquents and non-delinquents. 67 pages. \$1.00. Mic 56-73

#### EDUCATION FOR BUSINESS IN CHURCH-RELATED LIBERAL ARTS COLLEGES

(Publication No. 15,447)

Donald Ralph Danskin, Ed.D.  
The University of Oklahoma, 1955

This investigation constitutes an analysis of circumstances surrounding education for business in 156 church-related liberal arts colleges in the United States. The 156 institutions are: (1) liberal arts colleges, (2) currently offering business subjects, (3) related to protestant religious denominations, (4) co-educational, and (5) attended primarily by white students. Specifically, the problem involved an analysis of the following circumstances: (1) objectives of instruction, (2) organization for instruction, (3) subjects offered, (4) physical facilities for instruction, (5) student personnel services, and (6) the business faculty.

The conclusions may be summarized as follows:

1. One phase of the total educational program designed to provide students with a knowledge of culture and a Christian philosophy of life, the objectives of education for business in the church-related colleges should be: (1) to enable students to develop an understanding of basic business information which is of value to all people, and (2) to enable students to develop knowledges and skills which will be useful in specific business occupations.
2. Co-ordination of all phases of education for business is best facilitated through a departmental or divisional arrangement in which ultimate responsibility resides in a single person.
3. Highly specialized programs of study in numerous fields of business should be avoided. However, the programs of study by which students are prepared for specific occupations should be of sufficient scope to enable students to adjust readily to changing patterns of employment.
4. It is neither necessary nor desirable for church-related colleges to offer more than one degree for students of business nor to offer instructional programs that imply extreme specialization.
5. In most of the colleges, the subject-matter offering should be carefully examined in terms of the needs of students and the effectiveness of instruction. Revision of



programs of education for business should result in narrowing of the scope and diminishing the extensiveness of offerings with subsequent improvement in the effectiveness of instruction in the subjects ultimately retained.

6. Administrators of programs of education for business in church-related colleges must recognize the special requirements of physical facilities and equipment and provide adequately for them if education for business is to satisfactorily provide for the expanding needs of students.

7. If the effectiveness of instruction in business subjects is to increase, teachers must be provided with opportunities to extend their knowledge of subject-matter and their experience in the business world. In many instances, the instructional load of individual teachers should be reduced to enable them to improve their teaching effectiveness.

8. The program of education for business at Bethany Nazarene College compares favorable with the programs offered by church-related colleges throughout the United States. There is, however, evidence to indicate that the entire program should be carefully examined and revised to more adequately meet the needs of students. Every effort should be made to insure that physical facilities, instructional staff, and the administration of the program are such that students will be enabled to meet satisfactorily the general and technical requirements of business.

224 pages. \$2.80. Mic 56-74

#### PRACTICES IN SAFETY EDUCATION IN THE SCHOOL SYSTEMS OF SELECTED CITIES IN THE UNITED STATES

(Publication No. 15,451)

Lonnie Gilliland Sr., Ed.D.  
The University of Oklahoma, 1955

The purpose of this study was to obtain information that would enable school administrators, directors of safety, supervisors of safety, and teachers of safety to know what constitutes a good school safety program. Specifically the problem was to make an investigation of the recommended practices which should be observed in a safety education program in the schools and determine the current practices in the school systems of 56 selected cities in the United States during the years 1952 to 1955.

The facets of the school safety education program included were: (1) the historical background of the safety movement, (2) protection provided for school children in the proximity of the school, (3) instructional procedures and areas of safety included in the curriculum, (4) accident reporting by the schools, (5) kind of services furnished by non-school organizations and agencies and the extent to which the school systems used them, and (6) fire-exit drills.

A committee consisting of professors of education, school personnel, and enforcement officials assisted in developing the questionnaires utilized in this investigation.

The data were obtained from the school superintendents and the chiefs of police in the 56 selected cities.

From the results of this investigation the following conclusions are offered:

(1) Industry initiated the concept that accidents could be reduced by means of education.

(2) Improved mechanization has increased the need for more education in accident prevention.

(3) The problem of traffic control in the proximity of schools had been given very little study. No standardization of school signs, signals, markings, and pick-up drives had been established.

(4) Only a few areas of safety were taught by a large number of school systems.

(5) Safety was taught through correlation, integration, and co-curricular activities at the primary and intermediate grade levels. It was taught through correlation, integration, separate course, and co-curricular activities at the junior and senior high school levels.

(6) The safety patrol was the best pupil safety organization for the elementary grade level. The safety committee and safety council were the best for the secondary school levels.

(7) An accident report system was in use in a majority of these school systems.

(8) Non-school organizations and agencies had many worthwhile services that were used to supplement the school safety program.

221 pages. \$2.76. Mic 56-75

#### A COMPARATIVE STUDY OF SUPPLEMENTAL INCOMES OF MALE AND FEMALE TEACHERS IN THE PUBLIC SCHOOLS OF BEDFORD, CAMBRIA, AND SOMERSET COUNTIES OF PENNSYLVANIA

(Publication No. 13,872)

Frederick Stevens Kring, Ed.D.  
University of Pittsburgh, 1955

The determination of the extent and nature of supplemental incomes of public school teachers and the need for and effects of these incomes was undertaken with two objectives. The first of these was to analyze comparative data of an urban and a rural sample of teachers; the second objective was to discover differences between the data of the male and female teachers who participated in the study.

The geographic area selected for the study, located in southwestern Pennsylvania, contained a dichotomous division into urban and rural areas. The study was delimited to incomes during the period from September 1, 1953, to August 31, 1954. The survey instrument used consisted of a questionnaire requesting 42 factual and 25 attitudinal item-responses from the participants of the study. Fifty-one per cent of the teacher population returned completed questionnaires.

The study contains analyses of 78 statistical tables which summarized personal and professional data, income data, types of supplemental work, utilization of supplemental incomes, and effects of supplemental incomes upon the teacher and the profession. A section of the study presented the unedited comments of respondents relative to the supplemental income problem and teaching as a profession.

Although little difference was noted between the

professional preparation of urban and rural teachers, the median urban contractual salary (\$3,908) exceeded the rural median (\$3,560) by nearly 10 per cent. About 40 per cent of all teachers reported supplemental incomes; more than 71 per cent of male teachers reported such income compared to about 21 per cent of female teachers. Median supplemental incomes were reported as follows: urban males--\$592; rural males--\$620; urban females--\$360; rural females--\$375. Less than six per cent of respondents had supplemental incomes in excess of \$1,000, while less than one per cent reported such incomes in excess of \$2,000.

About one-fifth of teachers' wives had income from some source; the median determined for urban wives was \$1,083 compared to \$1,750 for the rural group. The median income of the husbands of urban teachers was \$4,200, and for rural husbands, \$3,485. Median total family-unit incomes of \$4,842, \$4,544, \$4,487, and \$4,558 were reported for urban males, rural males, urban females, and rural females, respectively. About two-thirds of total family-unit incomes included a source other than the teacher's contractual salary. Contractual salaries supplied less than 70 per cent of total family-unit incomes. About 62 per cent of teachers did not have sufficient income from all sources to support a family of four.

Because of insufficient income from teaching, economic necessity and the desire to maintain a professional standard of living provided the impetus for teachers to earn additional income from other pursuits. Marital status and number of dependents greatly influenced the degree of need for this additional income. The supplemental income problem was far more acute among male teachers than female teachers, except in cases where two members of the family were employed. Both male and female teachers recognized greater economic justification for male teachers to supplement their incomes.

In earning their supplemental incomes, the teachers engaged in many professional and skilled occupations which provided valuable vocational experience. However, many jobs were of such nature as to provide a harmful effect upon the teaching profession. One-third of the teachers who engaged in supplemental work indicated that teaching failed to provide sufficient occupational satisfaction. Although teachers tended to minimize the deleterious effects of supplemental incomes upon themselves and the performance of their professional duties, about two-thirds of the teachers thought that the teaching profession lost status when teachers engaged in outside employment to supplement their incomes. 201 pages. \$2.51. Mic 56-76

#### PROBLEMS OF BEGINNING OFFICE WORKERS

(Publication No. 15,114)

Frank Edward Liguori, Ph.D.  
University of Pittsburgh, 1955

The purpose of this study was to determine the problems of beginning women-office workers in obtaining and holding jobs as experienced by the workers and as seen by employers.

The data were obtained by interviewing 120 beginning women-office workers and 22 employers. The office

workers were graduates of 42 high schools and had not more than four months of work experience with 36 companies in the greater Pittsburgh, Pennsylvania, and the greater Cincinnati, Ohio, areas. Interview blanks were used to provide uniformity in gathering the data. Comments and explanations were recorded in shorthand by the interviewer.

The employees and employers were in general agreement concerning the nature of the problems of beginning office workers. As they sought employment, beginning workers encountered certain major problems related to locating job opportunities, obtaining job leads, completing application blanks, having interviews, handling job references, and taking employment tests. In general, these problems were attributed to unsatisfactory instruction or inadequate counseling in high school.

Although most beginning workers aspired to stenographic and secretarial positions, only a comparatively small number were successful in obtaining such positions. After entering employment, beginning employees encountered a variety of problems which were for the most part related to job skills, attitude toward work, personal relationships, personal qualities, and office environmental conditions. These problems generally were attributed to both high school instruction and the office situation in which the workers found themselves.

From the interview data, it was concluded that a majority of beginning office workers had inadequate knowledge and training for the various aspects of job finding and job holding. Their job aspirations were unrealistic in terms of what business had to offer them. The workers often were confused and unhappy because of the difficulty of adjusting to the realities of a working life. These difficulties were related, for the most part, to skills as well as to personal qualities. Even though business and education have entered into an era of cooperation, it is evident that this program of cooperation must be developed to a considerably greater state of effectiveness if adequate job counseling and job training are to occur in schools.

From data reported in this study it is recommended that a closer cooperation between business and education be established for the purpose of providing realistic instruction and practice in job getting and job holding. High schools should consider modification of course offerings and course content on the basis of follow-up studies. Counseling programs should be developed in order to deal adequately with all phases of job getting and job holding. High schools should consider the development of instructional programs in personality building and good grooming. Business should assume a share of responsibility by counseling workers on the job to help in overcoming unhappiness and dissatisfaction and to aid in the rapid adjustment of beginning workers to the realities of their working life. 227 pages. \$2.84. Mic 56-77



**AN ANALYSIS OF THE RELATIONSHIP BETWEEN  
THE READABILITY OF TEXTBOOKS AND THE  
ABILITIES OF STUDENTS IN A JUNIOR  
HIGH SCHOOL**

(Publication No. 15,101)

Fannie Alpern Pittler, Ph.D.  
University of Pittsburgh, 1955

It was the purpose of this investigation to analyze the relationship between the readability of the textbooks and the abilities and needs of the students in junior high school. One junior high school located in a large metropolitan center was the subject of the study. Four techniques were used to gather the data: (1) a readability measure of the textbooks, (2) a rating sheet to obtain teacher judgments of the books, (3) a Student Guidance Questionnaire to find the socio-economic and personal data about the students, and (4) interviews with a sample group of students from each class in each grade to get student reaction to the textbooks.

The books were measured by the Yoakam Readability Formula which is based on vocabulary load. The Readability scores ranged from grade three to grade eleven with the median at 6.1. The scores thus obtained were then compared with the publishers' grade placement of each of the 106 books. Sixty-two, or 58.5 per cent, scored above the intended grade level; five, or 4.7 per cent, were at the same level as the grade scheduled by the publishers; and 39, or 36.8 per cent, measured below the grade for which they were intended.

The teachers rated the 63 books which had been used extensively during the year. Since the 34 classes in the school were grouped on the basis of reading ability, the teachers found that the basic textbooks written for the junior high school were fairly adequate in the average or better reading groups but did not meet the needs of the slow reader. They also found that in addition to the readability of the book, interest appeal, format, and treatment of the content were other factors to be considered in the selection of books for junior high school.

The student judgments of the textbooks agreed for the most part with the opinions of the teachers. The range in reading ability among the students was wide—grade two to grade eleven. The majority had reading achievement ratings below the school median of 6.1. The children recognized their reading difficulties in the content areas. Most of them expressed an interest in reading but found very little time to do much reading out of school except for comics and magazines. Television consumed on an average 3.7 hours per day. Responsibilities at home or participation in activities in community centers of recreation took more of available free time. It was concluded that the reading done in school would have to be challenging enough to compete with these other interests.

The final analysis of all of the data led to the following conclusions:

1. Slow learners have most success with books written at third- or fourth-grade vocabulary levels.
2. Differentiated reading materials are needed to meet the needs of all readers in the average classroom.
3. The readability measure cannot be considered as an absolute indicator of the suitability of the textbook but is the major factor to consider in getting the right book into the hands of the right reader.

4. Books written for the elementary school do not meet the needs of junior high school students even when the readability of the book is adequate.

5. Most junior high school basic textbooks for the content areas do not meet the needs of the reader whose ability is below the average of the group.

6. In the research concerned in this study teachers found a close correlation between the readability of the textbooks and the manner in which the books were usable with a particular reading group.

7. The child's total needs—his ability, his personality, his experiences, his environmental background, his interests—should be taken into account in planning his reading program.

114 pages. \$1.43. Mic 56-78

**THE INFLUENCE OF INSTRUCTION IN  
OCCUPATIONS AND SELF-APPRAISAL ACTIVITIES  
UPON THE VOCATIONAL PREFERENCES,  
VOCATIONAL INTERESTS, AND VOCATIONAL  
ATTITUDES OF HIGH SCHOOL GIRLS**

(Publication No. 15,168)

Sister Mary Catherine Walker, Ph.D.  
Northwestern University, 1955

The Problem

The purpose of this investigation was to study the influence of instruction in occupations and self-appraisal activities upon the vocational preferences, interests, and attitudes of high school girls on four grade levels. Several sub-problems were involved in the major purpose of the study, foremost of which were: stability of vocational choice; range in choice of vocation; certainty of vocational choice; reasons for choice of vocation; status level of preferred vocations; the relationship between measured vocational interests and professed vocational interests (vocational choices); the relationship between vocational preferences and the measured attitude toward those choices; and the aspect of student reaction to the total experience of the investigation.

Procedure

An experimental group and a control group on each of the four grade levels of high school participated in the study. The average class size was 30 with a range of 28-32 students in each of the eight groups. The study was carried on for a period of ten weeks and consisted of three phases: (1) orientation and testing; (2) instruction in occupations and self-appraisal activities; and (3) re-testing.

Both the experimental and control groups took part in the first and third phases of the study, each of which lasted one week. Testing and information materials used with all the subjects consisted of the SRA Primary Mental Abilities test; Kuder Preference Record Vocational; Miller-Remmers, Scale to Measure Attitudes Toward Any Vocation; and two questionnaires. Additional tests administered to the subjects in the experimental group were the California Test of Personality, Minnesota Clerical Test, and California Aptitude Tests for Occupations as follows: General Sales, Personal-Social, Computational, and Scientific.

The experimental group only experienced the instruction in occupations and self-appraisal activities. Each

class met with the investigator forty minutes a day, five days a week, for a period of eight weeks. Twenty vocational guidance films made up the core of instruction, although other techniques used in the study were the reading of career books, student interviews of workers, lecture, and class discussion. Student self-appraisal was facilitated by group instruction in the interpretation of test data, and by individual interviews with the instructor.

### Results

The findings in the study indicate that the vocational choices, vocational interests, and vocational attitudes of high school students are definitely affected by occupational information and self-appraisal activities. The percentage of change was greater in the case of the experimental group than in the case of the control group with respect to:

- (1) "first three" and "last three" choices of vocation;
- (2) greater certainty of vocational choice; (3) status level of vocational choices; (4) measured vocational interests; and (5) attitude ratings of chosen vocations. In many instances the differences between the percentages recorded for the two groups were statistically significant.

According to student reaction, the freshman year ranked first and the senior year second as the "most helpful" grade-placement for a course in careers and self-appraisal. A separate course in careers was preferred to a unit on occupations in another course, and a one-semester course was preferred to a ten weeks course or a course lasting one year. Of the techniques used in the study, vocational guidance films were rated the "most helpful" and "most interesting" method of obtaining information about occupations. More than 50 per cent of the subjects in the experimental group rated the instruction in occupations and self-appraisal activities "superior," in comparison with other courses currently being taken in school; 97.6 per cent of the subjects on all grade levels recommended that the course be incorporated in the existing curriculum.

323 pages. \$4.04. Mic 56-79

## EDUCATION, ADMINISTRATION

### CRITICAL BEHAVIORS OF ELEMENTARY PRINCIPALS IN THE IMPROVEMENT OF INSTRUCTION

(Publication No. 15,342)

Dayton Benjamin, Ed.D.  
Stanford University, 1955

The purpose of the study was to clarify the perceptions of fifty elementary teachers and fifty elementary principals regarding the nature of "effective" supervisory behavior of elementary principals. The inquiry was deemed valuable because of the apparent lack of specificity in the current literature on recommended supervisory practices of elementary principals.

The research design involved use of the critical incident technique because of its adaptability for obtaining reports of particularly effective and ineffective supervisory behaviors. Behaviors were considered "critical"

when one type of behavior was reported in both its positive and negative aspects by members of the same respondent group.

Data were gathered by individual interview. Respondents were employed in various school districts throughout California.

The final data comprised four hundred specific incidents which were classified under the following three major headings:

- I. CURRICULUM MATERIALS AND INSTRUCTIONAL PROCEDURES
- II. MENTAL HYGIENE OF TEACHERS
- III. ADMINISTRATIVE ARRANGEMENTS

Incidents were then ordered under appropriate subheadings, after which similar incidents were grouped together by writing descriptive phrases to include their common elements.

The following is the final collection of the critical behaviors of the elementary principals, as perceived by teachers:

1. Participates in the classroom activities as a helper to the teacher and does not interrupt.
2. Teaches class occasionally to relieve teacher for other duties, respecting plans made by the teacher.
3. Builds teacher's confidence by demonstrating knowledge of teaching procedures.
4. Observes class and follows up with a clear, direct evaluation of the teacher's work.
5. Uses formal evaluation conference as objective agreement concerning strengths and weaknesses previously discussed.
6. Supports teacher in his relations with children and parents.
7. Relieves teacher of clerical details to allow more time for preparation and actual teaching.
8. Grants teacher's request for help from staff psychologist.

The following is the collection of critical behaviors of the elementary principals, as perceived by principals:

1. Becomes thoroughly acquainted with the teacher's capabilities before suggesting a new procedure.
2. Waits until the new teacher becomes acquainted with the children, the philosophy of the school system, and its routines before suggesting major changes in procedures.
3. Waits until teacher is emotionally ready to accept suggestions for change.
4. Listens sympathetically to teacher's personal problems and offers assistance when asked.
5. Arranges visit to another teacher, making certain that no stigma is attached to a visitation, and discusses visitation thoroughly.
6. Arranges a three-way conference with supervisor and teacher, and helps to follow through with suggestions of the supervisor.

The following is the collection of the critical behaviors of the elementary principals, as perceived by both teachers and principals:

1. Follows through with teacher in the development of new techniques and procedures.
2. Helps teacher improve classroom control by giving suggestions that apply directly to the problem area.



3. Provides direct assistance in utilization of instructional materials.
4. Considers teacher's preferences and ideas when making suggestions.
5. Makes certain that teacher has knowledge of background of situation before making suggestions.
6. Demonstrates teaching procedures in such a way that children's respect for the teacher is preserved.
7. Brings instructional materials to classroom and shows teacher how to use them with particular youngsters.
8. Gives direct praise for specific accomplishments.
9. Gives reassurance that teacher is generally doing a good job.
10. Arranges for teacher to attend a conference to discuss problems of a particular child.
11. Gives teacher an assignment in which he feels important before other school and community adults.
12. Complies with teacher's request for expediting additional plant facilities and instructional supplies.

115 pages. \$1.44. Mic 56-80

#### THE OPERATION OF A COUNTY PLAN FOR EDUCATIONAL DEVELOPMENT THROUGH LAY AND PROFESSIONAL PARTICIPATION

(Publication No. 15,347)

Grenville Carlton Jones, Ed.D.  
Stanford University, 1955

The problem is to analyze the three-year study of educational services completed in Contra Costa County in 1953. The major purpose is to determine if the recommendations approved by the General and Professional Committees and the Citizens Advisory Council were implemented at the district level and if they resulted in changes in educational services in the schools of the county.

It is also the writer's purpose to determine if certain concomitants of the major aim were accomplished:

1. Did the study encourage the flow of ideas among the districts which participated?
2. Were the procedures used effective in accomplishing the major purpose?
3. Was the Cooperative Study truly cooperative? Did it use group processes?
4. Did the study stimulate communication between public service agencies such as the county office of education, the participating school districts, the state department of education, the University of California, the county health department, the county library department, and the county social services department?

The analysis is based upon interviews with participating members of the Cooperative Study and upon a study of the unpublished data gathered during the progress of the study. In order to determine if the recommendations of the Study Committees were implemented at the district level, the writer interviewed lay and school personnel in selected districts and checked this evidence by examining courses of study, library guides, nurses' bulletins, teachers' handbooks, board minutes, curriculum reports, and other available data.

The dissertation consists of seven chapters. Chapter I explains the background for the Cooperative Study, outlines

the problem, describes the limitations of the study, and tells the method of research. Chapter II describes the recent literature on lay participation in the public schools, with particular emphasis upon the work of the National Citizens Commission for the Public Schools. Chapter III discusses the principles and criteria followed by successful committees in working on school problems and outlines the purposes and guidelines for the Contra Costa Cooperative Study. Chapter IV discusses the development of the Cooperative Study and gives the reasons for its organization. Chapter V describes the work of the Library Study Committee in one elementary district, one secondary district, and one unified district. The chapter presents in detail the methods used by the Library Committee in determining the districts' library problems, the procedures used in making recommendations for the solution of these problems, and their work in assisting citizens and school personnel in implementing these recommendations. Chapter VI is devoted to a similar description of the Health Committee's work in two elementary districts. Chapter VII states conclusions which appear to be substantiated by the data and lists recommendations which may be of value to any counties or districts which undertake a similar study.

The following conclusions have been drawn:

1. With certain exceptions the methods of organization and participation used throughout the Contra Costa Cooperative Study measured up to the criteria outlined for its conduct.
2. Observable changes in educational services to the children of the county resulted in library services and health services.
3. The techniques and procedures used by the study committees were elementary, but some were effective in defining problems, analyzing needs, and implementing limited changes in educational services.
4. There is evidence that the study encouraged the flow of ideas among districts. Effective educational practices used in one district were passed on to other districts.
5. The study stimulated communication and cooperation among public educational agencies.

In light of the findings, certain recommendations are made relating to means of financing a study, selection of personnel, choice of leaders, citizen participation, and the importance of following established lines of authority.

179 pages. \$2.24. Mic 56-81

#### WHAT DOES THE CITIZENRY WANT TO KNOW ABOUT ITS SCHOOLS: AN ANALYSIS OF FOUR UPSTATE NEW YORK CENTRAL SCHOOL DISTRICTS

(Publication No. 15,024)

Oswald Henry Laubenstein, Ph.D.  
Cornell University, 1955

The purpose of this study was to determine how much information and what information the general public wanted to have about its schools. It further proposed to determine if any differences existed between sub-groups, such as between parents and non-parents, tax payers and non-tax-payers, old-timers and newcomers, and high and low income groups.

A pre-tested questionnaire of sixty-two items covering the areas of administration, curriculum, evaluation, extra-curricular activities, finance, methods of teaching, personnel, school and community cooperation and participation, and school services was administered to 386 adults in four upstate New York Central School Districts. All respondents were members of one or more of the various civic, professional, service, social, church or fraternal organizations in the community. The questionnaire was completed by the individual in the presence of the investigator at a regularly scheduled organization meeting. The questionnaire was devised so that the respondent could indicate that he wanted more information about an item, or that he already knew the information and did not seek additional facts, or that he considered the item unimportant.

For the four communities it was found that at least one out of every two respondents wanted more information on 53 of the 62 items. Not only did the citizenry want a great deal more information about their schools than they now had, but they also considered this information important to them. Less than one person in four considered any single item unimportant.

Considering those statements about which two-thirds or more of the respondents wanted information, almost one-half were in the area of school services; a quarter of the items dealt with the curriculum; and the remaining quarter of the items concerned the methods of teaching, evaluation, finance, and personnel.

Using the Chi-Square test of significance, it was found that parents wanted more information than non-parents in certain communities in the areas of curriculum, methods of teaching, personnel, school and community cooperation and participation, and school services. In two communities, non-parents were more interested than were parents in information about finance. In the area of evaluation, in two communities the high income group wanted more information than did the low income group. No significant differences were found in any of the nine major areas of school management between school taxpayers or between old-timers and new comers.

Information most desired by the public centered around such issues as developing personality, teaching study habits, evaluating the entire school program as compared with that in other schools, and the teaching of spiritual and moral values.

The information least desired and best known to the public was in those areas with which they came in direct contact, such as voting at a school meeting, the work of the Parent-Teacher Association, the election of school Board members, bus transportation, and school attendance laws.

The study has prompted the investigator to make these recommendations:

1. The Board of Education in each community should sponsor a continuous, dynamic, comprehensive, and planned program of public relations to inform the people more adequately of the status of its schools.
2. As a part of this public relations program, emphasis should be given those programs and projects which will bring the public into the schools. In addition to a Parent-Teacher Association, which each community now has, an Adult Education Program and a School Citizen's Committee were suggested.
3. As a starting point, because of the apparent present

interest, areas of school services, curriculum, methods of teaching, and finance should be emphasized.

4. A similar survey should be conducted periodically, perhaps at five-year intervals, to determine the will and wishes of the people in the community.

244 pages. \$3.05. Mic 56-82

#### THE GUIDANCE NEEDS OF STUDENTS AT THE UNIVERSITY OF THE PHILIPPINES

(Publication No 15,348)

Esperanza Ruiz Limcaco, Ed.D.  
Stanford University, 1955

This study is an exploration of the guidance needs of the University of the Philippines and its students, an analysis of current trends, and a proposal, in general terms, of expanded guidance services for this university. There are three general principles observed in the analysis of needs and in the formulation of the program. The first is that this guidance shall be for all students; the second, that an effective guidance program requires clear definition of functions and clearly identifiable leadership; and the third, that effective guidance program provides for continuous in-service training of the whole institutional staff and for the establishment of procedures which facilitate interaction between guidance and instructional personnel.

The resolution of the problem and the basis for the proposed development by the author evolve from a synthesis of the conclusions reached from three lines of investigation; namely, (1) the experience of the writer in the University of the Philippines as a former student and later as a member of the faculty, (2) the writer's two years of study and observation of developments in the student personnel or guidance field in the United States, and (3) the results of the study of student and institutional needs by means of two questionnaires, one, administered to the U.P. guidance personnel and the other, administered to over four hundred students.

Looking at the needs of the University of the Philippines in terms of the principles stated above, the writer notes that (1) at the present stage of the University's student personnel program, guidance for all students is difficult to achieve, primarily because of lack of sufficient time to do counseling by the part-time guidance counselors, (2) that there is no clear definition of functions of the guidance personnel, and (3) that a strong leadership is necessary to meet the weaknesses of the present situation.

The survey of student problems indicates that a rough sampling of U.P. students reports many problems which are related to the kinds of services usually found in an effective university guidance program.

The proposed guidance program besides defining the duties and functions of the guidance personnel recommends the adoption of the "Student Personnel Point of View" for its philosophy and a modified line-and-staff relationships in its administration. A Dean of Students who will be on the same level as the academic deans in the hierarchy of the administrative set-up will head-up and coordinate the different guidance services. 143 pages. \$1.79. Mic 56-83



# AN EVALUATION OF VOCATIONAL COUNSELING DONE BY A SPECIALIZED COUNSELING AGENCY

(Publication No. 15,144)

Paul Edmund Lindh, Ph.D.  
Northwestern University, 1955

The purpose of this study was to evaluate the vocational counseling done by a proprietary firm of industrial psychologists and to determine the characteristics of the clients who were most satisfied with the counseling.

The method used was a follow-up of 100 clients, randomly selected from a population of 343 counseled between October, 1947 and July 30, 1954. The principal techniques used were the personal interview, the re-administration of personality inventories based on the Bernreuter and the Humm-Wadsworth Temperament Scale, and the administration of a job questionnaire developed by Brayfield.

This study was a combination of follow-up, client opinion, expert opinion, and within-group changes.

An attempt was made to determine the relationships between client satisfaction with counseling and the factors of age, measured intelligence, amount of formal education, measured vocational interests, occupational experiences prior to counseling, personality characteristics, post-counseling vocational experiences, and job satisfaction with the jobs held at the time of the follow-up investigation. The 100 clients were divided into five groups on the basis of satisfaction with counseling.

The results indicated there was no relationship between client satisfaction with counseling and measured intelligence or the amount of formal education. The clients who had high measured vocational interests were more satisfied with counseling than the clients who lacked any high measured vocational interests. The clients who had the most pre-counseling work experiences were more satisfied with counseling than those who had no work experience or a limited amount prior to the time they were counseled. The older clients were more satisfied with counseling than the younger clients, had more normal personality patterns, were more satisfied with the jobs they held at the time of the follow-up investigation, and followed with greatest consistency the suggestions given them by their counselors.

The general conclusions were that 85 percent of the clients felt the counseling was worth while, that only 10 percent of the clients were very dissatisfied with the counseling, that all groups of clients showed more normal measured personality patterns at the time of the follow-up investigation, that using the criterion of whether the clients had referred or would refer other persons for counseling was not valid since only one client indicated he would not refer other persons and only three others expressed some hesitancy.

246 pages. \$3.08. Mic 56-84

# A STUDY OF THE FRESHMAN MATHEMATICS PLACEMENT PROGRAM AT THE UNIVERSITY OF OKLAHOMA

(Publication No. 15,456)

Harold Wilbert Linscheid, Ph.D.  
The University of Oklahoma, 1955

The mathematics department of the University of Oklahoma gives a mathematics placement test to all entering freshmen. The results are used to place students in mathematics R (remedial mathematics), mathematics 2 (intermediate algebra), or mathematics 21 (a first course in mathematical analysis).

The purposes of this study were:

1. To determine which criteria may be used to supplement the mathematics placement test.
2. To find a practical discriminant function.
3. To determine the relative value of the forty items of the placement test in separating students into ability groups.

Data obtained for 1832 freshmen who entered the University of Oklahoma in September, 1952 included performance on the placement test, the Iowa High School Content Examination (I H S C), the Ohio State Psychological Examination (OSPE), the grade earned in the first mathematics course taken in college, and grade point averages in mathematics as well as general grade point averages in both high school and college.

The principal findings were:

1. Distributions of mathematics 21 students with respect to nearly all variables showed less "scatter" about the mean than did the corresponding distributions for students in remedial mathematics and mathematics 2.
2. The probable error of prediction of college grade points in mathematics was approximately two-thirds of a grade point, based upon regression equations in which the independent variables were  $X_1$  (placement test raw score),  $X_2$  (decile rank on mathematics section of the I H S C),  $X_3$  (decile rank on O S P E total score), and  $X_4$  (high school mathematics grade points). The probable error of prediction increased slightly when only  $X_1$  and  $X_2$  were used as independent variables.
3. Separations among the three groups of mathematics students based upon discriminant functions using four independent variables were slightly better than separations produced by discriminant functions using  $X_1$  and  $X_2$  as variables.
4. Discriminant functions developed for separation were  $5X_1 + 4X_2 - 75$  and  $2X_1 + X_2 - 49$ . From a practical standpoint, the single function  $X_1 + X_2$  could be used to place the students in the three groups. For example, by placing those students for whom  $X_1 + X_2$  was less than seventeen in remedial mathematics, thirty-one of the sixty-nine failures in mathematics 2 would have been avoided.
5. The placement test served better as an instrument for separation of students in mathematics 2 and mathematics 21 than for separation of students into remedial mathematics and mathematics 2.
6. Measures of general ability showed too much overlap between mathematics groups to serve as a basis for separation into ability groups in mathematics.
7. Based upon responses by 1211 students, eight items

of the placement test had more than a fifty per cent correct response, while thirteen items had less than a twenty per cent correct response.

153 pages. \$1.91. Mic 56-85

### THE FINANCIAL SUPPORT AND CONTROL OF PUBLIC JUNIOR COLLEGES IN THE UNITED STATES

(Publication No. 15,349)

William Jackson McCallum, Ed.D.  
Stanford University, 1955

The purpose of this study was to determine the nature and character of the financial support of the public junior colleges of the United States, and to investigate the controls that have been imposed upon the junior colleges as a consequence of this support. The inquiry has been deemed timely because of the rapid growth of junior colleges in the past decade.

The study has attempted to achieve its purpose through the medium of a questionnaire sent to all the administrators of public junior colleges in the United States. The questionnaire was designed so that the person answering it expressed his opinion concerning the financing of his junior colleges as well as his opinion concerning the controls imposed upon that junior college. An analysis of the responses to the questionnaire was made and a consensus of opinion was formulated with respect to the nature of the support and control of public junior colleges. An attempt was also made to investigate the relationship between the source of financial support and the type of controls exercised over the junior colleges.

The findings of this study indicate that the principal sources of income for the junior colleges are: state financial aid; local income from local taxes; and tuition collected from students.

State financial aid to the junior colleges is variable both in total amount received and in the proportion of the total income it represents. The financial contributions to the support of the junior colleges made by the individual states vary within wide limits according to states. The proportion which any individual state assumes is also variable. No universal pattern of state aid is readily discernible between states nor within the various states.

The apportionment of state aid is not uniform either as between states or within an individual state. State aid may take the form of: a direct grant; a legislative appropriation; aid based upon a formula of student attendance; or aid based upon "class-room" units.

The nature of local financial support also varies from state to state and within the various states. The proportion of total costs covered by local taxation ranges from complete support to no support at all. Within some of the states the variations in methods and amounts of local support are as great as they are between the states. There is no apparent relationship between the amount of state support and the proportion of support contributed by local taxes in states permitting tuition charges.

The proportion of the total support of the junior colleges which is represented by student tuition varies between states and from school to school within the states. There

is a tendency for student tuition to be a larger proportion of the income of those junior colleges which do not receive any substantial state aid as contrasted with those schools which do receive greater state aid.

Controls imposed upon the junior colleges as a result of state support are mainly controls which result in audits of expenditures and of attendance reports. There is no evidence that the various states exercise any undue influence or control over the educational policies of their junior colleges as a result of state financial support.

Local controls, as a result of local financial support, are more common than are state controls growing out of state financing. The local controls generally relate to the expenditure of funds and the determination of educational policies of the schools. The influence of the state universities upon the determination of educational policy was considered a minor factor by junior college administrators.

It has been concluded that controls exercised over the junior colleges as a result of financial support are essentially reasonable and do not seriously interfere with the educational objectives of these institutions.

In general, junior college administrators express satisfaction with present controls over educational policy. Junior colleges desire improvement in the financing of their institutions. Improvement is desired in the form of added state support for operations and for long range building programs.

153 pages. \$1.91. Mic 56-86

### RECRUITMENT FOR TEACHING

(Publication No. 15,299)

Fabian Allan Meier, Ed.D.  
University of Maryland, 1955

Supervisor: Professor James A. Van Zwoll

The general purposes of the thesis, "Recruitment for Teaching," are (1) to determine the present recruitment activities of the Departments of Education or of Public Instruction in the forty-eight states, selected public teacher-training institutions, selected high schools, and lay or professional organizations, and (2) to suggest likely or promising activities that might be used in developing a program of action for the recruitment of teachers. The study is based upon library research and data obtained from checklist returns from state education authorities and teacher-training institutions.

Recruitment is defined as the encouraging of promising persons to become interested in teaching as a profession. The following basic principles are the foundation of the study:

1. Leadership in teacher recruitment is a responsibility of the state.
2. Teacher recruitment is a major responsibility of the members of the teaching profession.
3. The partnership concept of education between the people and the state places a responsibility for recruitment upon lay people.
4. The recruitment process requires a unified and coordinated effort on local, state, and national levels.
5. The recruitment process must be continuous, positive, and selective.



6. The classroom teacher is the key person in the total process.

The present recruitment activities of the forty-eight states include conferences on the teacher shortage, appointment of state recruitment directors, mobilization of former teachers, publication of recruitment materials, conversion programs, supervised experiences of a teaching nature for students interested in teaching, teacher education scholarships, and indirect incentives for prospective teachers. The data indicate that the typical state has not assumed its responsibility for recruitment.

The recruitment efforts of ninety-five teacher-training institutions are usually limited to traditional or customary activities such as participation in Career Days, Campus Open House, Future Teachers of America Chapters, and the publication of recruitment materials. The typical institution reported activity in approximately fifteen of the thirty items included on the check-list. Teachers colleges and colleges of education are slightly more active in recruitment than multi-purpose colleges or universities.

The high school is in the most strategic position in the recruitment process. The influence of good teachers and opportunities for experiences working with children seem to be the most powerful incentives in considering teaching as a vocation.

Several lay and professional associations such as state parent-teacher associations, state chambers of commerce, and professional education associations have recently indicated growing interest in teacher recruitment by initiating action programs in various states. The function of these programs has usually been to interpret the need for teachers to the public and to stress the opportunities and advantages of teaching.

The study recommends the appointment of state recruitment directors or coordinators, state-wide conferences on teacher recruitment, conversion programs for college graduates lacking professional education courses, mobilization of former teachers, generous scholarships for prospective teachers, preparation of attractive recruitment materials, teacher recruitment committees in teacher-training institutions and local school systems, supervised experiences with children for students interested in teaching, clubs for students interested in teaching, and an increased emphasis on teacher responsibility in the recruitment process.

241 pages. \$3.01. Mic 56-87

#### THE EFFECTS OF THE INTERNSHIP IN EDUCATIONAL ADMINISTRATION UPON THE UNIVERSITIES PARTICIPATING IN THE PROGRAM

(Publication No. 15,095)

Mellicent Scott Moorhead, Ph.D.  
University of Pittsburgh, 1955

The purpose of this study was to determine the effects of the internship in educational administration upon the universities participating in the program. The problem was delimited to eight universities, included in the Middle Atlantic Region of the Cooperative Program in Educational Administration, which conducted an internship program for the further preparation of the educational leader. The type of research utilized in this study was the normative survey.

The data were collected by personal interview with staff members of the universities and from documents pertinent to the internship at the respective universities.

Before the effects of the internship programs in existence at the eight universities could be examined, it was necessary to establish criteria. These criteria served as a basis for the examination of the programs. The development of these criteria or elements of an internship program was accomplished by an analysis of the literature on internship programs in three fields namely, the medical internship, the internship for federal service, and the internship in educational administration. The four categories that emerged in this analysis were: (1) the integration of the internship with the total preparatory program, (2) the university staff, (3) the administrative procedures and policies, and (4) the interaction between the university and sponsoring agency. Each of these categories also have contributing factors. These factors were implied in the literature as inherent properties of each category.

After the elements and factors contributing to these elements were developed, a description of the internship programs at each of the eight universities in relation to these elements was given in four chapters corresponding to the four elements established. To facilitate the analysis of the internship programs at each of the universities, each university's internship program was described in a section of the chapter that pertained to the composition of the elements. Each section was concluded with a list of essential findings and tables representative of those findings.

The essential findings of each chapter section were brought together in the last chapter and the conclusions were based on an interpretation of these findings.

This study shows that the internship in educational administration has had a good effect on the university. Although it has not altered or revised the course offerings in relation to the preparation of the educational leader, it is considered a supplement to the formal academic program for which graduate credit is given. The amount of credit given varies at the different universities and is dependent upon the amount of time the intern spends at the sponsoring institution.

All the universities have a staff member designated as the "coordinator" or "director" of the program but staff time for the organization, administration, and supervision of the program is allotted at only four of the universities. Through visitations to the sponsoring agencies, conferences with sponsoring administrators, conferences with other professors of school administration, and contributions to literature, the university professors closely associated with the internship program have increased in professional stature.

Since the internship in educational administration is a new type of professional training for the educational leader, new procedures had to be created in selection of the intern, his supervision, his evaluation, and the delegation of responsibilities.

This study shows that the internship in educational administration has contributed to a closer relationship between the university and sponsoring agency. Though the publicity given to the program has not been extensive, several of the universities have received publicity that has informed the public of the endeavors of the universities to develop educational leaders of quality.

163 pages. \$2.04. Mic 56-88

# PERCEPTIONS OF SUPERINTENDENTS' COMPETENCIES BY SCHOOL BOARD MEMBERS

(Publication No. 15,351)

Theo John Norby, Ed.D.  
Stanford University, 1955

## Statement of the Problem

This study constituted an attempt to identify and describe the characteristics of the school superintendent that school board members considered essential for success. The justification for a study of this kind was found in the fact that effective superintendent's behavior is dependent, in part at least, on his understanding of the way in which he is perceived by members of the board of education.

An examination of the relevant professional literature indicated that no study had been completed which revealed in somewhat behavioral terms, the competencies that school board members considered important for the successful superintendent.

## Procedure

The procedure used in this study involved the compilation of anecdotal descriptions of the behavior of successful superintendents known to school board members in California. From the anecdotes provided by this group, a list of competencies was developed in as behavioral terms as possible. These competencies were placed under appropriate major headings and from this a questionnaire-rating scale was constructed. This questionnaire, with a covering letter, was sent to each member of the school board in a randomly selected fifty percent of those California school districts employing a superintendent. Sixty-two percent of these school board members made returns.

## Results

The responses were analyzed in terms of the following categories: the superintendent in his policy-planning relationships with the school board, the superintendent in his policy-execution relationships with the school board, the superintendent and the building of a public relations program, the superintendent in his personal relationships with the school board, the superintendent in his personal relations with the school staff, and an additional category of two items related to the superintendent's use of alcohol and tobacco.

For each competency, the following statistical terms were used: (N), (M), (SD) and (SEM). When these measures were figured, the competencies in each classification were listed in their rank order. The difference between items were then tested for statistical significance by use of the "t"-test for correlated means.

## Conclusions

Those conclusions and generalizations that seem warranted within the limitations of the study are presented.

1. There is considerable variation among school board members with respect to the qualities and abilities considered necessary to success in the superintendency.

2. School board members, generally, place their greatest emphases on those abilities and skills which the modern

educational administrator considers most desirable. Therefore, the superintendent can safely assume more of the professional leadership function just so long as he works within the frame work of good communication with all those concerned.

3. School board members place particular value on those competencies that relate to the superintendent's ability to work creatively and sincerely with his professional educational staff.

4. Members of school boards tend to be particularly concerned about the superintendent's ability to assist in the formulation and execution of policy,

5. The personal qualities and interests of the superintendent of schools are considered of significant importance to school board members only when they affect the execution of his professional position.

6. It appears that it would be important for a prospective superintendent to determine as accurately as possible the perceptions of superintendents' competencies held by the board and by the individual members themselves.

7. Findings seem to have rather strong implications for the character of administrator-education.

123 pages. \$1.54. Mic 56-89

# WHAT SUPERINTENDENTS IN SELECTED SCHOOL DISTRICTS HAVE DONE TO IMPROVE THE EDUCATIONAL PROGRAM

(Publication No. 15,103)

John Ewing Reed, Ed.D.  
University of Pittsburgh, 1955

This study was undertaken to determine what superintendents in selected school districts of Western Pennsylvania have done to improve the educational program, to ascertain by whom and how improvements were initiated and carried out, and their present status.

The case study method was used. The school systems studied were selected by a jury of experts as doing outstanding work in improving the educational program. Superintendents of these districts were interviewed and notes taken. Anyone mentioned by the superintendent as having anything to do with the improvement was interviewed at a later date. Every improvement was followed through until all individuals concerned were interviewed. Any conflicts in information furnished were noted and a recheck was made with the superintendent.

It was found that improvements in the educational program did not emanate from a single source but received their impetus from varied sources. Their stimuli were the administration, teachers, community, accrediting and other agencies, and a combination of these factors. Educational improvements emerged on a broken front; what was new in one district had long been an established reality in a second and had not as yet been instituted in other districts. The introduction of an improvement made later additions an easier process, and a service offered at one level of instruction tended to facilitate its establishment on another. Improvements that represented marked change in policy seemed to occur in clusters.

The educational program received the most attention in the districts where the superintendent had administrative



assistance. In other districts he was too burdened with routine to devote much time to the educational program. Administrators in general did not seem to be aware of the need for experimentation and regarded it as a peripheral activity. Generally speaking superintendents were sensitive to an imagined conservatism of public attitude rather than to the reality of public opinion.

In-service education was one area in definite need of attention. There was little evidence that the professional growth of the teachers was of primary concern to the administration, and likewise the influence of teachers' professional organizations was lacking. Teachers were concerned with personal economic gains and not professional growth. Where they did exercise professional leadership, it was usually in their own subject area or in relieving themselves of an onerous duty. Teachers seldom initiated improvements that resulted in the expenditure of funds.

Democracy in education was still seldom practiced. It was noted that teachers played a minor role in initiating and developing administrative policies and procedures. The lay public was consulted when its support was needed on a particular issue. Only one school district had a permanent Citizens' Committee on Education. Students were rarely consulted about changes; outside the area of extra-curricular activities they contributed practically nothing.

Accrediting agencies seemed to have made their influence felt in encouraging educational improvement in all areas of the program. They were not only concerned with attaining set standards for accreditation but encouraged continuous improvements regardless of current attainments.

The lay public was little concerned with improvements that were markedly professional in nature. Their chief concern was remedial and special education at the elementary level, recreation, and leisure classes. The majority of improvements initiated by the lay public involved the spending of capital funds.

The educational attainment of the professional staff and the lay public has improved over the years. Any school administrator who fails to utilize every source of help in improving the educational program may lose his most effective implementation of procedure.

284 pages. \$3.55. Mic 56-90

# A STUDY OF SUPPLEMENTAL INCOMES OF FULL TIME ADMINISTRATIVE PERSONNEL UNDER TENURE IN THE PUBLIC SCHOOLS OF SELECTED COUNTIES OF WESTERN PENNSYLVANIA

(Publication No. 13,890)

William Edward Rodemoyer, Ed.D.  
University of Pittsburgh, 1955

The purpose of this study was to determine the extent, nature, and effects of supplemental incomes upon school principals. The questionnaire technique was employed to gather data from respondents representing 18 counties of western Pennsylvania.

For comparative purposes the data were tabulated according to the types of principalship held by the respondents: elementary principals, secondary principals, and

supervising principals. Additional comparisons were made by separating the responses of those supplementing and those not supplementing. The data were interpreted in terms of the number and percentage of responses. Medians and ranges were used where applicable.

The job tasks performed by the supplementing principals were found to be mostly of a professional or semi-professional nature. There were numerous sources of income not requiring specific employment. Reasons given for engaging in supplementation were mostly concerned with current costs of living. However, a number of other reasons were also evident.

The greatest single source of supplemental income was found to be in actual job tasks. The second most important source was independent income. The amounts of supplemental income reported ranged from a few dollars to four thousand dollars per year. The earnings reported were for the 1953 - 1954 school term and the summer of 1954. The median amount of supplemental income earned was \$667. Thirty-nine per cent of all respondents were found to have personal supplemental incomes. Fifty-three per cent had some type of extra-contractual income either through their own efforts, through their spouses, or both. Relationships were shown between supplementation and contractual salary, dependency load, and age. Other relationships were developed around the use of supplemental income, the amount of such income, the income of spouses, and the respondents' estimates of a true professional salary. The estimated true professional salary was found to have a high relationship to contractual salary. Other relationships were found to be nonsignificant. The median contractual salary of all principals was \$5,633, while the estimated true salary of the group was \$7,274.

The effects of supplemental income activities were found to have a varying relationship in different aspects of the study. In most cases a detrimental effect was evidenced by a majority of the respondents. Part of the data on effects was presented in the form of pertinent comments offered by the participants in the study.

It was concluded that all supplementary income practices do not have a detrimental effect but, at the same time, there was no evidence of beneficial effects except in isolated cases. Supplementation involved more than the mere acquisition of funds, although this motive was almost always present if not paramount. Social, emotional, physical, and mental factors were found in the supplemental income problem. Therefore, the mere act of increasing compensation would not provide a total solution.

The extent to which administrative services in the schools were affected by supplemental income practices varied. This was influenced by a number of environmental factors as well as by supplemental income activities. Infringements upon the time of the individual for recreation, relaxation, home life, and reflective thinking were considered as dangerous elements of supplementation.

The degree to which time could be devoted to extra-contractual income activities without adverse results was affected by the type of work performed, type of position held, size of school, family conditions, and individual differences. The degree to which supplemental income activities existed was affected by salary level, degree of occupational satisfaction, acquisitiveness, and personal sense of values.

Consideration for the effectiveness of the educational

program was the focal point of the study, and it ends with recommendations for implementing the findings.

158 pages. \$1.98. Mic 56-91

**DIFFERENCES BETWEEN PERCEIVED  
ADMINISTRATIVE BEHAVIOR AND ROLE-NORMS  
AS FACTORS IN LEADERSHIP EVALUATION  
AND GROUP MORALE**

(Publication No. 15,384)

Russell Thornley Sharpe, Ph.D.  
Stanford University, 1955

**Statement of the Problem.**—This is an empirical study of how administrators' behaviors, as seen by their teachers, themselves, and members of the superintendent's staff, deviate from role-norms held by these same individuals and how these deviations are related to evaluations of leadership and teacher morale.

**Procedure.**—Three questionnaires were developed, adapted from forms devised by Carroll L. Shartle and his staff at Ohio State University, which measured respectively morale, perceived behavior, and concepts of role-norms. These were administered to 243 teachers and thirteen principals in the elementary schools of a city system with an average daily attendance of 7,566 pupils, and to twelve selected members of the superintendent's staff. All participants described their ideal principal. Teachers descriptively rated their principal and the morale in their school; principals rated themselves; and the staff rated the same principals. Complete returns were obtained from all principals, from 86.8 per cent of the teachers and from 91.7 per cent of the selected staff members. Responses were scored and tested for differences with chi-square, "t" technique, and analysis of variance, and for relationships by rank-difference correlation.

**Results.**—It was found that:

1. The ideal principal was conceived by the various groups of respondents as highly communicative, closely identified with the group led, moderately open in his attitude toward change, and non-dominant. The respondents exhibited bias toward male leaders who were identified with the upper socioeconomic class in the community. Values associated with American middle-class culture, democratic ideology, and current educational philosophy were projected in this configuration.
2. Members of different status groups in the school organization held essentially the same concept of an ideal principal, teachers, and administrators differing significantly only 10 per cent of the time.
3. Perceptions of the characteristics and behaviors of the actual principals varied according to the observers' self-concepts, interests, and needs. Observers were more conscious of a principal's weaknesses than of his strengths.
4. Occupants of high status positions perceived the principals as deviating more from the ideal norms

than did those in lower status positions. Staff members and teachers differed significantly in their perceptions about 25 per cent of the time.

5. Teachers and staff members perceived the principals as deviating less from the ideal norms than did the principals themselves.
6. Correlations, significant from the .05 to the .001 level, were obtained between the evaluation of the principals' over-all leadership and the degree to which they were perceived as conforming to the ideal norms of high communication, low separatism, open attitude toward change, low domination, high prestige, and strong influence in the community.
7. Equally significant correlations were obtained between the morale of the teachers and the degree to which the principals were perceived as conforming to the ideal norms of communication, separatism, change, domination, and community prestige and influence. A strong and significant relationship was also found between morale and leadership evaluation.

**Conclusions.**

1. The study demonstrated that some of the generalized hypothetical concepts of role-norms and role behavior can be tested empirically and related to leadership success and group morale.
2. The study yielded additional insights into the social, cultural, and organizational forces which influence leadership evaluation and morale. It also reinforced and amplified current situational theories of leadership and opened the way for the structuring of an integrated theory of leadership in terms of role-norms and role-playing.
3. By demonstrating that leadership evaluation and morale are closely related to the degree to which the leader conforms to his observers' norms and by showing that these norms are culturally conditioned, the study has called attention to the importance of taking cultural factors in the leadership situation into account in studies of leadership.

485 pages. \$6.06. Mic 56-92

**LEGAL ASPECTS OF FEDERAL AID TO  
SECTARIAN SCHOOLS**

(Publication No. 15,476)

John Charles Thompson, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: Willard E. Goslin

This study is an inquiry into: (1) public aid to sectarian schools, with particular reference to grants from the Federal treasury; (2) the forms this aid has taken; (3) the attitude of state and Federal courts thereto. Since parochial schools enroll approximately 95 per cent of all nonpublic elementary pupils and 80 per cent of all nonpublic secondary pupils, the official Catholic attitude toward state aid of sectarian schools has been recorded; also the non-Catholic attitudes.



Two significant aspects of popular education in the United States during the past fifty years are the large increase in Federal aid and the pronounced growth of the Catholic school system. These factors, plus Catholic insistence upon additional state aid for more than 11,000 schools and 3,500,000 pupils, have combined to create a new problem in church-state relations.

The Federal government has had direct interest in education from the beginning of our republic. It has provided schooling for Indians, and, through numerous land grants, has encouraged young states to create liberal educational systems and to establish colleges and universities. In 1917, through the Smith-Hughes Act, it entered upon a national program of vocational education which now costs the government \$29,000,000 annually.

Federal spending in behalf of education became prodigal in the school lunch program which soared to \$118,000,000 by 1951, in NYA, PWA, WPA, and since World War II in the education of veterans. The Federal government spent in one recent year \$3.7 billion on all educational projects. There is, or was, no prohibition on sectarian schools with respect to: veterans' education, school lunches, NYA, defense research programs, grants by the National Science Foundation, and the token sale of one and one-half billion dollars worth of surplus war property.

Between 1851 and the present, many state courts rendered decisions on public aid to sectarian schools. These courts were overwhelming in their affirmation of the separation of church and state.

Four religio-educational disputes have reached the United States Supreme Court, all since 1920. In three instances—the Oregon case, Louisiana textbook case, and New Jersey bus case—the rulings have tended to bolster the Catholic campaign for public recognition of their schools. The McCollum case was an oblique victory for the Catholic school cause.

What will the results be? Must our national government be committed to the support of sectarian schools, or will our "wall of separation" between church and state stand fast?

The issues are tremendous, involving not only the survival of the public schools, as we know them, but indeed basic governmental relationships, and the entire democratic, indigenous way of life.

A body of opinion is growing, but it has not yet solidified into a firm and invincible national policy. Until American society has reached an equilibrium, the judicial decisions doubtless will continue to reflect uncertainty.

In a very real sense, the future of America lies within the discretion of the Supreme Court. No longer is the problem one of whether public money for sectarian schools is legally possible. The chief obstacle to an appropriation of state funds will continue to be the express state constitutional prohibitions. But the Supreme Court has given notice that the First Amendment still stands in the background as a final barrier against excesses which have not yet been precisely defined.

126 pages. \$1.58. Mic 56-93

## A STUDY OF THE ADMINISTRATIVE PRACTICES USED IN THE OPERATION OF THIRTY SELECTED PART-TIME SCHOOL CAMP PROGRAMS IN MICHIGAN

(Publication No. 14,282)

Thomas W. Walton, Ed.D.  
Michigan State University, 1955

### I. STATEMENT OF THE PROBLEM

This study was undertaken to: (1) determine the administrative practices used in thirty selected part-time school camps in Michigan; (2) analyze these practices in relation to current literature on camping, records and materials used in specific programs, and observation of programs; and (3) systematize and present these practices in a form which would be useful to school administrators.

### II. METHODOLOGY OF THE STUDY

A review of the literature on organized camping revealed that camp administrative practices could generally be classified under four major divisions: (1) Facilities, (2) Personnel, (3) Program, and (4) School Camp-Community Relations. As a result these four divisional headings became the categories under which the administrative practices discussed in this thesis were treated. Problems common to directors of organized camps were discovered from the literature and from interviews with camp leaders. A list of these problems was developed and presented to six Michigan school camp leaders for additions and corrections. From these corrected lists an interview schedule was developed and tested on three Michigan part-time school camp programs. As a result of these trial interviews a further revision of the interview schedule was made.

Selection of the thirty programs used in this study was made from the seventy-nine part-time school camp programs operating in Michigan as of October, 1953. This selection was made through use of a set of criteria developed by the writer for this thesis.

Once the selection was made, letters were sent to the directors of selected programs requesting an interview date. All directors responded and interview appointments were confirmed. The research interview technique was used and responses were recorded directly on the interview schedule. The responses were transferred to a master frequency chart from which Chapters IV, V, VI, VII, and VIII were developed.

### III. SUMMARY OF MAJOR FINDINGS

#### Facilities

1. All but three part-time school camp programs used group camps owned by the Michigan Conservation Department. Maintenance and insurance were the responsibility of ownership.
2. Camp distance from school and emergency services was not generally a factor in camp site selection.
3. Infirmarys were maintained in over half of the camps studied.

4. Recreational facilities for staff, craft workshops, museums, and lounges were generally provided in camp programs studied.
5. Financial assistance was received by a majority of the part-time programs.

#### Personnel

1. The mean number of campers attending one session was 70.1; the grade level ranged from grades 4 through 12 with the sixth grade being the most frequent.
2. The average cost to campers in all programs was \$8.23. Less than half the camper groups earned money to defray camper fees.
3. The hiring of substitute teachers was the most frequently used solution to the problem of providing instruction to those children who were unable to attend camp with their group.
4. Staff participation was voluntary in over 85 percent of the programs.
5. Part-time school camp staffs were composed of school personnel, nonschool personnel, and parents.
6. In 95 percent of the programs the duties of the camp director were performed in addition to other major teaching or administrative responsibilities.

#### Program

1. Part-time school camp programs were planned with the assistance of children in all programs. The majority of programs were planned in considerable detail before leaving for camp.
2. Teacher visitation to the camp site before planning was the technique most frequently used to aid children in precamp planning.
3. Precamp orientation was provided for school staff in over 75 percent of the programs studied, but was provided for nonschool staff in less than 50 percent of the programs.
4. The only criterion used to select campers for attendance at camp was freedom from communicable disease.
5. Evaluations of part-time school camp programs were received from four sources: (1) campers, (2) teachers, (3) parents, (4) other community sources.
6. Objective, semiobjective, and nonobjective types of evaluation were used in the school camp programs studied. Nonobjective techniques were the type most frequently used.

#### School Camp-Community Relations

1. Community precamp planning committees were reported by over one-half of the programs.
2. All camp directors indicated some form of public relations techniques should be used to interpret school camp activities to the community.
3. Few school camp groups had contact with professional camp personnel or organizations.

4. Few school camp groups utilized any techniques to develop sound relationships with the camp community.  
289 pages. \$3.61. Mic 56-94

#### PERSONNEL FACTORS, WORKING CONDITIONS, AND TEACHER TURNOVER IN SEVENTH-DAY ADVENTIST ACCREDITED SECONDARY SCHOOLS IN THE UNITED STATES

(Publication No. 15,317)

Wilton Henry Wood, Ed.D.  
University of Maryland, 1955

Supervisor: Professor James A. van Zwoll

#### PROBLEM:

This investigation was undertaken to discover the relationship of personnel factors and working conditions to teacher turnover in Seventh-day Adventist secondary schools in the United States. The ultimate aim of the study was to bring into focus the main reasons given by principals and teachers for frequency of transfer to other schools or to other forms of employment, in order that practical remedial recommendations might be made to stabilize teacher tenure.

#### METHOD:

The investigation was conducted as a normative-survey type of research. Data were collected by questionnaire. Its reliability was checked by interviews of one-sixth of all the teachers. The respondents' data were validated against the entire group statistically. The questionnaire evolved incorporated elements from the literature, consultations, and preliminary tests. Questionnaires were sent to all teachers and principals in the Seventh-day Adventist secondary schools, of whom 81.75 per cent responded.

By means of the chi-square statistic, significant differences at the .05 level of confidence were sought between the transfer group and those who remained in position during 1948-54 for each of the factors studied.

#### FINDINGS:

1. Teacher turnover averaged 30 per cent yearly during 1948-54.
2. Approximately one-half the teachers have had less than six years of teaching experience; sixty per cent had been in their last position less than three years.
3. Eighty per cent of the academy teachers estimated the staff morale in their school to be average or above.
4. This group of teachers appear to place more value on the psychological aspects of their situation than they do on the physical.
5. The three chief reasons given for transfer in order of frequency were: (a) "Felt duty-bound to respond to the call from another school," given significantly more often by those forty or more years of age and by those estimating the staff morale to be excellent or above average; (b) "Opportunity to teach in a larger school," given significantly more often by those below forty years of age; and (c) "Better administration apparent in new position," given



significantly more often by those who estimated their staff morale to be below average or poor.

6. There appears to be a statistically significant relationship to teacher turnover for the following: residence, age, whether or not a teacher was teaching the combination of subjects he was trained to teach (significant for 1954-55 transfers), teacher's estimate of teaching load, institution where academy teacher received bachelor's degree, sex and marital status, years of teaching experience, in-service training, and number of positions held.

A significantly greater number of those teachers of high morale than those of low morale chose the factors of morale "pleasant physical working conditions," "freedom to go to superiors for counseling," "friendly attitude of fellow teachers," and "administrative assistance, cooperation, and support." Significantly more of those of low morale than of high morale chose the factors "pupil's attitude of respect toward teaching," "equal pay for equal work (equal distribution of the work load)," and "opportunity to participate in the development of policies affecting one."

With the intent of reducing the turnover evident, IT WAS RECOMMENDED THAT:

1. All certificated teachers after a two-year internship be placed on "continuous tenure."
2. Mature teachers of proved ability be assisted in purchasing their own homes by initial low rate loans.
3. A personnel manual be drafted for use in all schools.
4. Future administrators be required to have at least thirty semester hours of professional training and that internship training in administration be established.

Other recommendations concerned the assistant principalship, placement, uniformity in reporting staff changes, staff participation in policy formulation, and more uniformity in salary and the time required to reach the maximum.

290 pages. \$3.63. Mic 56-95

## EDUCATION, ADULT

### THE EXPRESSED EDUCATIONAL NEEDS OF OLDER-AGE ADULTS IN TWO SENIOR CENTERS

(Publication No. 15,345)

Edward Harmon Haworth, Ed.D.  
Stanford University, 1955

The purpose of the study was to determine the expressed educational needs of older-age adults and to recommend therefrom a program for the expansion and improvement of an adult education curriculum.

Two senior centers, one in San Francisco, the other in Menlo Park, California, provided the population for the study. At each center two samples were taken, (1) a sample consisting of volunteers and (2) a systematically selected sample. Participants were questioned regarding their educational and vocational experiences and were given an opportunity to express their educational needs as they perceived them.

Statistical comparison was made of the volunteer and random samples at each center with respect to sex, age, marital status, and educational level on the assumption

that if no significant differences were found between the two samples, the data gathered could be treated as having come from one sample. No significant differences were found.

The combined San Francisco sample was compared with the combined Menlo Park sample with respect to sex, age, marital status, and educational level. No statistically significant differences were found. The two combined samples were pooled to form one homogeneous sample composed of 259 persons ranging in age from 60 to 85, with a mean age of 69.4. Of these, 206 were women and 53 were men.

The needs expressed covered a broad range of educational activities. The most frequently expressed need was for more knowledge of world affairs, followed by the need for improvement in the command of written and spoken English. Homemaking and commercial subjects ranked high.

The needs expressed in San Francisco and in Menlo Park were compared and found to be substantially alike. Where differences were found, they were largely in degree and not in kind.

The participants were almost equally divided with respect to preference for attendance in classes with students of their own age range versus attendance in classes with students of all adult ages. A clear preference for daytime classes was expressed.

Educational needs were expressed by 70.7 per cent of the participants. The needs were classified under the objectives of adult education in San Francisco. The educational offerings of the adult schools of San Francisco were similarly classified and compared with the expressed needs. To a large extent the San Francisco adult education program was found to be meeting the needs as determined by the study.

The following recommendations were made:

1. That current courses in the San Francisco Adult Education program which were shown to be meeting expressed needs be retained.
2. That the classes which were included in the program in recent years and which were shown to be closely related to expressed needs be considered for inclusion in the program again in the future.
3. That consideration be given to inclusion in the program of courses in health for the aged, consumer education, and home nursing, areas in which there were expressed needs but no adequate offerings in the curriculum.
4. That the present policy of scheduling some classes exclusively for older people at locations that are convenient for them be continued.
5. That the preferences of the older people for daytime classes be given consideration.
6. That the Adult Education Division encourage the further expression of needs by older-age adults and that it employ all means at its disposal to continue to discover the educational needs of older people.
7. That experimental courses be offered from time to time to explore needs which might not be discovered in other ways.

145 pages. \$1.81. Mic 56-96

## EDUCATION, HISTORY

A CURRICULAR HISTORY OF  
GRINNELL COLLEGE, 1848-1931

(Publication No. 15,357)

Shelton Lee Beatty, Ph.D.  
Stanford University, 1955

**The Topic:** The dissertation (1) traces the course of study of Grinnell College from its wholly prescribed curriculum in 1850 to 1931 and (2) appraises the extent to which the College maintained its original purpose of general education and of common studies and yet gave the student controlled freedom to satisfy his individual and preprofessional interests.

**Procedure and Methods:** In 1948 the writer found in the Trustees' vault of Grinnell College (Iowa College until 1909) a large number of the founders' and early professors' manuscript records thought to have been destroyed by tornado and fire in 1882. From these and other sources the writer composed a short history of the College, and he then proceeded to a running analysis of the curriculum with tables to summarize and compare at special intervals the modifications made by the Faculty.

**Results:** The founders and the Faculty built a New England type of college chartered "to promote the general interests of education" and to qualify students "for the different professions and for the honorable discharge of the various duties of life." In January 1857 Iowa College admitted women to instruction. The College closed in Davenport in December 1858 and reopened in Grinnell in 1861, having merged with Grinnell University. In 1862 began the Ladies' and the Scientific Courses, the first curriculums parallel to the Classical. In February 1895 the three descendants of the parallel curriculums, the Classical, the Philosophical, and the Scientific, having more than half their courses and seven general requirements in common, became completely recast in the new Group System adapted from Johns Hopkins and Bryn Mawr. The new system required six basic studies in every group, two majors of 20 semester hours each, and approximately 40 hours in elective studies. The College never adopted a free elective system. In 1910 Grinnell converted the second major into a minor of 16 hours and in 1922 increased the single major to 24 hours. The College had 15 majors and one minor in 1910 and 26 majors and two minors in 1931.

Greek, Latin, and Mathematics constituted 58 per cent of the course in 1856. Greek and Latin ceased as absolute requirements in 1895, and Mathematics followed in 1917. In effect, required English supplanted both modern and ancient languages. The laboratory sciences won complete recognition in 1889. The social sciences flourished extraordinarily in the 1920's through the emphasis on preprofessional studies which began in 1901. Music won the status of a B.A. major in 1913 and Art and Drama in 1931.

The seven distributive requirements in 1894, the final year of the parallel curriculums, included English, German, History, Philosophy, Mathematics, Laboratory Science, and Religious Science. In 1931 the College maintained four common studies: English, a Social Science, Philosophy or Psychology, and a Laboratory Science.

In 1928 the Faculty recognized the need to redefine the

common studies and the whole program for the degree. The projected seven fields of orientation remained still-born, and fundamental revision had to await another college generation because of the depression of the 1930's.

**Conclusions:** Through 81 years the curriculum in all its changes provided general and distributive studies and concentration. The Faculty in 1928 sought but failed to give a larger place to the common studies without injuring the student's right to pursue preprofessional and personal interests through general instruction. Compressed into 81 years, the Grinnell College curriculum forms a microcosm of American collegiate curricular changes from 1636 to 1931. 533 pages. \$6.66. Mic 56-97

A HISTORY OF THE EARLY CHURCH AND  
CHRISTIAN EDUCATION FROM THE BIRTH OF  
CHRIST TO THE COUNCIL OF NICEA: A.D. 1-325

(Publication No. 14,275)

Homer Hughes Hawes, Ph.D.  
Michigan State University, 1955

Major Professor: Carl H. Gross

The purpose of this study is to trace the historical development of the church and Christian education through the first three hundred and twenty-five years of our era.

From the beginning of the Christian movement to 324 A.D., when Constantine became the sole ruler of the Roman Empire, Christianity was a despised and persecuted religious sect. It possessed no legal rights and its adherents were subjected to every sort of abuse and cruelty. In the face of this opposition the church grew. Its influence spread until under Constantine the church enjoyed the official sanction of the government and, for better or for worse, found itself in a position of power in the affairs of state.

As the church was originally constituted learning took place in an atmosphere of freedom and mutual respect. Influences contrary to these principles arose within the church and grew phenomenally following the death of the last of the apostles. The forces which were contrary to freedom and equality in the early church grew in proportion to, and parallel with, the increase in power of the sacerdotal caste, which maintained its position contrary to the early Christian concept of the universal priesthood of believers.

As rule by presbyterial councils gave way to monarchical episcopates in the early churches the teaching function shifted from the membership and its chosen leaders to the bishops and their clergy. Although the freedom of the earlier Christian assembly was, no doubt, maintained in some places, authoritarianism in theory and practice became increasingly evident in the church at large throughout the period.

The educational activities of the church were at first conducted solely by the congregations. Educational organizations, extra-congregational in form, developed as need arose. The catechumenal school, which in the second and third centuries became a highly developed educational system, arose out of the need to teach pagan converts the



fundamentals of the Christian religion in preparation for baptism. The Christian elementary school, beginning in the second century, grew out of the conflict between Christianity and the pagan educational system. Schools were established at Edessa in Gaul and elsewhere to provide instruction for Christian youth in the common branches of human learning. The institutions of higher learning in the early church were the catechetical schools. These schools, located in the important centers of culture, represented the forces of early Christianity in coping with the intellectual powers of paganism. The curricula in most of these schools included not only the study of the Scriptures but also a liberal representation of subjects from philosophy and the sciences. In both scope and quality the curricula of the catechetical schools were comparable to those of the best of the pagan schools. The greater emphasis was placed upon the exegetical study of the Scriptures, for which study all other subjects were considered as but a preparation and an introduction. The broad curriculum, including a variety of subjects both sacred and secular, was followed by the catechetical schools of Alexandria, Antioch, and Caesarea. Carthage, however, found no place for pagan learning and followed strictly the position stated by Tertullian: "Let our seeking be in that which is our own, and from those who are our own, and concerning that which is our own."

There were three distinct schools of thought in education represented in the catechetical schools of the third century. The schools of Alexandria and Caesarea led by Origen represented the eclectic position in philosophy and the allegorical method of interpretation. Tertullian and the school of Carthage rejected all philosophic aids and held that the only true interpretation of Scripture was that which had been accepted and taught by the fathers of church consistently through past ages back to the apostles. Lucian and his followers who were of the school at Antioch differed with both, and representing the critical point of view presented a historical interpretation of the Bible.

The Council of Nicea, A.D. 325, is the terminal point in the study. The character of the church was greatly modified by the action of the Council. By deciding an issue by majority vote and by anathematizing dissenters a new principle of authority was established. After Nicea ever greater emphasis is placed upon the authority of creeds and church tradition. The catechetical schools gradually gave way to the cathedral and monastic schools. The hierarchies of Constantinople and Rome grew rapidly in power. All of these things introduce the student to another period in the history of education—that of the Middle Ages.

278 pages. \$3.48. Mic 56-98

#### DEVELOPMENT OF THE REVISED CURRICULUM PROGRAM IN VIRGINIA SECONDARY SCHOOLS

(Publication No 15,470)

Dan L. Oppeleman, Ed.D.

George Peabody College for Teachers, 1955

Major Professor: Louis E. Armstrong

This study of the Revised Curriculum Program of Virginia—the first state-wide attempt to base the curriculum

on social functions rather than subject matter—during the period 1931-1950 traces the development of the core curriculum in Virginia secondary schools and the alterations in that program caused by World War II and the adoption of a twelve-year system of public education.

The dissertation is based upon State Department of Education publications, reports, and memoranda; doctoral dissertations on various aspects of the Revised Curriculum Program in high schools of Virginia; professional journals of education; high school records; reports; diaries and correspondence; and printed radio programs. These written sources have been supplemented by interviews with participants in the revision movement, and by examination of the literature in curriculum revision, educational history, psychology, and educational philosophy.

The study examines the history of curriculum revision in selected schools and states. After detailing the growth of interest in core education and integrated studies within Virginia, it considers the organization of the Revised Curriculum Program.

Much emphasis is given the three-year phase of study, discussion, experimental production, and trial of materials which preceded the widespread operation of the Program. All publications implementing or explaining the revision movement are analyzed and discussed.

Recognition is accorded the contributions of Virginia colleges, both as teacher-training institutions and as centers for curriculum study and development. Teacher-education programs designed to support the Program are summarized and subjected to critical analysis. The organizational structures and functions of the curriculum centers are likewise described, with accounts of the roles assigned to various participants.

There is also emphasis upon the unique services of the high school curriculum counselors, who guided high school core curriculum teachers and provided liaison between the secondary institutions and the colleges. In addition, illustrative programs in selected high schools of the state are described, to reveal the variety of approaches employed within the Revised Curriculum Program, and to demonstrate the practical field problems which are involved.

The study considers that modifications in the Revised Curriculum Program were caused by (1) hostility or lack of interest among state educational leaders after 1941; (2) the demands of war-time emergencies; and (3) the expansion of the school system to incorporate an additional grade. These modifications implemented the original Program through increased emphasis upon school-community cooperation, guidance, and vocational studies; but controverted core curriculum philosophy when they moved away from unifications of the subject fields and pupil-centered instruction.

Among the successes of the Revised Curriculum Program may be listed: (1) effecting widespread changes in the philosophy, administrative organization, courses of study, and materials of instruction of many Virginia secondary schools; (2) popularizing use of broad units of subject matter; (3) improving techniques of pupil-planning, research, and collateral reading for the solution of social and personal problems; (4) expanding vocational courses; (5) improving and augmenting guidance programs; (6) developing a larger and more efficient supervisory system.

During the course of the Revised Curriculum Program, pupil drop-out was markedly decreased, closer community-school relationships were noted, and there was an increase

in the holdings, services, and use of school and community libraries.

Handicaps to the Revised Curriculum Program include: (1) the restraining influence of traditional high-school teaching methods; (2) low salary schedules; (3) loss of trained personnel to the armed forces; (4) failure to develop understanding of the Revised Curriculum Program among the majority of high school teachers before the Program was put into operation; (5) failure of Virginia colleges to maintain a consistent program of teacher-preparation in core-curriculum methods.

331 pages. \$4.14. Mic 56-99

COMPARISON OF AGRICULTURAL EDUCATION  
AND ADVISORY SERVICES PROVIDED FOR  
RURAL-URBAN FRINGE FAMILIES IN SELECTED  
AREAS OF THE UNITED STATES  
AND GREAT BRITAIN

(Publication No 15,303)

Russell Spence Ratcliffe, Ed.D.  
University of Maryland, 1955

Supervisor: Professor Gladys A. Wiggin

The problem of this thesis was to survey the needs of the rural-urban fringe group for agricultural advice and education in terms of the following objectives:

1. To ascertain the demands placed upon agricultural advisory services by fringe populations;
2. To describe the changes in programming and methods of advisory service needed to fit fringe group needs;
3. To indicate numbers, training and experience of agricultural advisory service personnel needed to serve fringe populations; and
4. To describe necessary changes in program and personnel of agricultural education needed for fringe groups.

To meet these objectives data were gathered for two metropolitan counties where the rural-urban fringe group is predominant in agriculture; Fairfax County, Virginia and Surrey County, England. Supporting information presented for analysis comprise surveys in both counties of the following:

- a. pertinent physiographic features
- b. historical development of agriculture
- c. population changes
- d. agriculture in the rural-urban fringe; including,
  - (1) size of holding.
  - (2) land utilization patterns.
  - (3) crops and livestock.
  - (4) economic classification of farms.
  - (5) detailed studies of representative areas within the rural-urban fringe.
- e. people of the rural-urban fringe; including,
  - (1) historical change in numbers and composition.

- (2) employment characteristics.
- (3) relationship between the fringe and other population groups.

- f. needs of fringe populations for agricultural advice and education.
- g. sources of agricultural advice and education for fringe groups through government advisory services and public educational services; including,
  - (1) history of growth of organization.
  - (2) their programs of service.
  - (3) volume of demand for assistance.
  - (4) staff composition in numbers, training and experience.
  - (5) cost of these services.
  - (6) supporting organizations.

An analysis of the data led to these conclusions pertaining to the rural-urban fringe areas in both counties surveyed:

1. Farms will continue to decline in size, increase in number; land values and costs of production will continue to rise; larger portions of income will be derived from sources other than farming; type of farming will shift from commercial to non-commercial.
2. Demand upon advisory services will increase because of greater total numbers of individuals in the agricultural population, greater complexity of subject-matter, inefficient operation of fringe area farms, reluctance of fringe operators to retain knowledge and skill provided them and less time available to fringe farmers for engaging in group discussions and demonstrations.
3. Programs of advisory services will change from production of agricultural commodities to provision of consumer information and education, and to education and assistance in home management, farm management and subject-matter areas typical of fringe areas.
4. Implementation of advisory programs will make greater use of individual farm or office visits and small group activities.
5. Numbers of advisory service personnel and costs of operation will increase as fringe areas predominate; the ratio of one agricultural worker to 500 or 1000 farms appears unreasonable if the fringe group is to be adequately serviced.
6. Training and experience of advisory workers for fringe areas will require greater preparation in general education and in specific subject-matter fields of interest to fringe farmers.
7. Education in public-supported schools in fringe areas should include:
  - (a). a rural emphasis in presentation of general subject-matter.
  - (b). provision for general education as part of the general curriculum of secondary schools.
  - (c). provision of vocational agriculture in secondary schools for students actually having a need for it.



8. Agricultural adult education for fringe groups has been neglected and needs to be given greater emphasis and scope.
  9. There is need for closer cooperation between the advisory and education staffs in fringe-area counties in order that each can contribute maximum support to the other.
  10. Further research is necessary for any other fringe areas surveyed since no two of them appear to be alike, and for finding ways to implement policies and programs of agricultural advisory and educational agencies serving the rural-urban fringe.
- 214 pages. \$2.68. Mic 56-100

#### CALEB MILLS, PIONEER EDUCATOR IN INDIANA

(Publication No. 15,107)

Andrew A. Sherockman, Ph.D.  
University of Pittsburgh, 1955

The purpose of this study is to narrate the story of the life and times of Caleb Mills, and to show the contributions which he has made to American education, particularly in the State of Indiana, both in higher education and especially in that of public education.

The documentary method of historical research has been followed:

Caleb Mills, a typical Yankee, was born in New Hampshire in 1806 and died in Indiana in 1879. He was a graduate of Dartmouth College and Andover Theological Seminary. He spent two years in the South and West, as an agent of the Sunday School Union. By choice, he went to Indiana to labor for the Home Missionary Society and to teach in the newly founded Crawfordsville English and Classical High School. Mills developed that school into Wabash College, based upon the classical curriculum of Dartmouth. Here Mills spent 46 years — two of them on leave of absence to become Superintendent of Public Instruction. He established a Normal School, based upon Samuel R. Hall's Teacher Training School.

Aware of the need for a public school system in Indiana, in 1846 Mills began a novel method for the establishment of such a system. The ideal of free popular education remained a lofty concept until his six widely read "Educational Messages," written under the signature "One of the People." Educational articles that he wrote for newspapers were signed "A Friend To Education."

Each message was in the form of an executive document, a copy of which was placed on each legislator's desk at the opening session of the Legislature. Every Assembly for five years found a new appeal. One of those messages was addressed to the Constitutional Convention.

The first two messages pointed out the facts of illiteracy. Pleas followed for adequate taxation by the State for free schools. He answered almost all objections, and presented arguments, all having the theme — free common schools for Indiana.

Mills' solution to the problem of poor rural schools was consolidation. His approach to equality of education was the abolition of the district system and, as a substitute, the township. He insisted that politics have nothing to do

with the selection of the candidate for State Superintendent of Public Instruction. His continued recommendations for County Superintendents were accepted. His persistent recommendations for the creation of township libraries were carried out successfully in contrast to that of Ohio which depended upon district libraries.

He steadfastly campaigned for normal schools and they were realized. His interest in higher education for women was a life-long and personally intense one. He campaigned and travelled extensively for that cause.

Mills was a nationally recognized educator. President Fillmore appointed him a member of the Board of Visitors to the Military Academy at West Point.

The Constitution of the Indiana State Teachers' Association was prepared by Mills, and to date it has not been materially changed. He was its President in 1859.

Those annual messages and reports, and his two publications urging revision of the common school laws, had decisive influence on the subsequent course of education in the State. As a matter of fact, a century later public school education continues largely as Mills had planned it.

In recognition of his signal achievements in public education, higher education, and religious education, honorary degrees were conferred upon him.

313 pages. \$3.91. Mic 56-101

#### EDUCATION, PSYCHOLOGY

##### A STUDY OF SOME FACTORS RELATED TO ACHIEVEMENT OF INTELLECTUALLY SUPERIOR EIGHTH-GRADE CHILDREN

(Publication No. 14,450)

Rodger Carskaddon Bishton, Ph.D.  
The Ohio State University, 1955

The purpose of this research was to determine the relative importance of certain social and psychological factors, in addition to other more objective data, that would account for the differences in the academic achievement level in a group of intellectually superior eighth-grade children. The investigator was interested specifically in studying the interrelationships that exist between the following variables: reading achievement, arithmetic achievement, language achievement, sex, chronological age, intelligence quotient, weight age, height age, father's occupation, vocational goal, behavioral immaturity, feelings of inadequacy, close personal relations, social participation, need for achievement, need for affection, need for conformity, need for dependence, need for heterosexual relationships, need for independence, need for mastery-dominance, need for recognition, preference for intellectual vs. non-intellectual school activities, preference for social vs. non-social out-of-school activities, extent of travel in the United States, and sibling status.

**SOURCE OF DATA:** The ninety-nine boys and girls who were the subjects of this study are all pupils from junior high schools in or near Columbus, Ohio. The average age in this group was 13 years, 8 months, and the median I.Q.

was 132. Boys and girls were almost equally divided in number. The physical development of 44 per cent of the same population was considered beyond normal expectation in comparison with that of their age-peers. The majority of them (75 per cent) came from homes whose socioeconomic status would be considered above average. The median number of children per family was two. Educationally, this group of intellectually superior adolescents had mastered the skills of reading, arithmetic, and language usage at least sixteen months beyond actual grade placement. Their preferences in the school curriculum were in the "thought" subjects, but more than half of them preferred sports to other out-of-school activities. The evidence seemed to indicate that they related themselves well with their parents, but that many felt some insecurity in terms of peer relationships. A profession of some kind represented the vocational goal of 71 per cent of this group.

**METHODOLOGY:** The California Achievement Battery, the Mental Health Analysis, the Ohio Youth Survey Needs Questionnaire, and a general information sheet were the primary source of data. The last-named device was used for obtaining information on physical growth, father's occupation, sibling relationships, vocational goal, and preferences for in- and out-of-school activities. The method of factor analysis was chosen as the appropriate method of analyzing the data.

**THE FACTORS:** Sixteen orthogonal factors emerged from the statistical treatment of the data. The interpretation of some of the more significant of these, in terms of variables highly loaded on each, is summarized below:

Factor I, best described as a general factor of achievement, appeared to underlie those variables which characterized superior ability, superior achievement, upper socioeconomic status, male superiority, and self-preoccupation.

Factor III represented a pattern of socioeconomic adjustment which suggested that adolescents from upper socioeconomic families tended to be submissive and conforming in their behavior.

Factor VII is best described as the ability to stand alone, i.e., belief in oneself.

Factor VIII can be designated as close peer relationships, and affinity for social activities.

Factor IX seemed to express achievement satisfaction. Persons who strive for superior achievement were apt to be strongly motivated by the need for approval, respect, and status from adults.

Factor X represented behavior maturity. The adolescent whose behavior adults consider "very grown up" is likely to enjoy the maximum freedom from adult supervision.

Factor XI suggested that boys who have reached manhood in their physical development tend to take over the value system of their fathers.

235 pages. \$2.94. Mic 56-102

# THE EFFECT OF CERTAIN EDUCATIONAL EXPERIENCES UPON ACHIEVEMENT IN MECHANICAL REASONING AND SPACE PERCEPTION

(Publication No. 15,094)

Lorenzo Mendicino, Ed.D.  
University of Pittsburgh, 1955

This study deals with the extent to which a year's experience in the tenth-grade vocational machine shop and related mechanical drawing influences achievement on standardized tests of mechanical reasoning and space perception. Analysis of the activities of pupils in this curriculum—more than half of the school year—points to continuous exercise of mechanical reasoning and space perception. Hence, this research is made to ascertain growth in those powers resulting from that experience.

The equivalent-groups method of experimentation was employed. To 176 boys just entering the tenth-grade vocational machine shop in September, 1954, and to 296 boys just entering the tenth grade of the academic high school—all in secondary schools of Western Pennsylvania,—were given the Mechanical Reasoning and Space Relations subtests of the Differential Aptitude Tests. From the two groups were drawn 150 pairs, equated on test scores, chronological age, background of experiences, and race. Nonexperimental factors were carefully controlled during the course of the experiment. At the end of the academic year 1954-1955, the boys were retested with the same tests.

The principal findings were as follows:

(1) The mean scores of the two groups each advanced by approximately six points on the Mechanical Reasoning Test and by approximately 11 points on the Space Relations Test, from which it may be concluded that the year of machine shop and mechanical drawing had no special influence on the aptitudes tested by the tests. Thus, the tests measure innate faculties.

(2) For further analysis of the test results, the scores of the top 40 per cent of the two groups were compared, as were also the scores of the bottom 40 per cent. The experimental factor had no more and no less influence on these groups at the extremes of the distribution than it did on the total distribution.

(3) A by-product of the investigation was the finding that of the 176 and the 296 who were first tested, the academic group averaged perceptibly higher on both tests than did the group entering the machine shop. This distinction, seemingly adverse, suggests the need for a scientific study of the bearing of the aptitudes measured by these two tests on achievement in machine shop. Such a research would furnish a basis for using or not using these tests to screen applicants for this curriculum.

119 pages. \$1.49. Mic 56-103



### BARRIERS TO HIGHER EDUCATION FOR IDAHO YOUTH

(Publication No. 15,353)

Stanley Gene Odle, Ed.D.  
Stanford University, 1955

**The Problem.**—The study concerns potential college population and enrollment barriers. Research was conducted in Ada and Canyon Counties, Idaho.

Specific objectives of the study were to answer the following questions:

1. What is the potential post-high school student population in southwestern Idaho?
  - a. What is the potential population in terms of youth of college-age?
  - b. What is the potential college population in terms of academic achievements of secondary school youth?
  - c. How many of this potential group should go to college?
2. What are the barriers to post-high school attendance?
  - a. Do financial limitations constitute a major barrier?
  - b. Do student educational and vocational aspirations reflect barriers?
  - c. Do high school curricula and personnel services constitute barriers?
  - d. Do home environments and parental aspirations impose limitations?
  - e. Do current military regulations impose barriers?
3. What resources does the region have for overcoming these barriers?
4. What plans can be suggested for increasing the educational opportunities of these youth?

**Methods of the Study.**—College population projections were prepared first in terms of the number of youth of college-age (18-21 years, inclusive) for Idaho and the survey counties, for the period 1955-1972. Estimates are based on birth statistics and survival tables since in-migration was shown not to be a factor in this area.

College population projections are also presented with reference to academic achievement of secondary school youth. Estimates indicate the number of twelfth graders in Idaho and the survey counties for the period 1954-55 to 1964-65.

Student self-reports and teacher ratings for 1096 seniors indicate college planning by seniors and ratings of various student academic strengths by teachers.

The investigation concerning the barriers to collegiate enrollment included five procedures.

1. A review of pre-admissions folders for 4461 prospective college students to determine a tentative listing of barriers for Idaho youth.
2. Ratings of the tentative barriers obtained from the review of the pre-admissions folders by superintendents, principals, and senior counselors in the survey counties.

3. A series of senior discussion groups in local high schools to identify barriers as perceived by students.

4. The summation of these data formed the content guide for the construction of a printed survey from which was administered to 1096 seniors, constituting 92.1 percent of the total number of seniors in the two counties.

5. Ratings were prepared by teachers for the 1096 seniors on several questions related to possible barriers for the students.

**The Findings and Recommendations.**—College population projections indicate the 1972 college-age population in Idaho will be 175 percent of the 1954 group. Ada and Canyon County numbers will double by 1972.

Twelfth grade graduate projections indicate an increase of one-third in the number in the state by 1964-65, with Ada County graduates doubling in number and a 50 percent increase expected in Canyon County.

Nearly 50 percent of the seniors of the survey counties plan to attend college in the fall of 1955. Ratings by teachers confirm the desirability of this proportion continuing.

Ten inter-related barriers were identified. Certain of these may be symptomatic rather than causal. Included were: (1) inadequate preparation for college, (2) student concerns relating to orientation and adjustment to college, (3) questions related to choice of a college, (4) immediate employment, (5) motivation, (6) finance, (7) marriage, (8) questions related to choice of college major and eventual vocation, (9) military service, (10) availability and effectiveness of personnel services.

The need for scholarships and financial aids was not found to be a major barrier in this area.

Recommendations centered about: (1) development of a state-wide evaluative program to identify college-caliber youth, (2) professionalization of guidance in Idaho and the extension of personnel services, (3) curricular enrichment in the secondary schools, and (4) studies of and programs developed which would increase student interest in and motivation for higher education.

338 pages. \$4.23. Mic 56-104

### A STUDY OF THE CHARACTERISTICS OF MALE STUDENT LEADERS IN CO-CURRICULAR ACTIVITIES AT NORTHWESTERN UNIVERSITY

(Publication No. 15,154)

J. Warren Perry, Ph.D.  
Northwestern University, 1955

#### Problem

The purpose of this investigation was to determine whether there were any identifiable and measurable dimensions which were characteristic of a group of male student leaders in co-curricular activities at Northwestern University. The sixty subjects, thirty-one seniors, fifteen juniors, ten sophomores, and four freshmen, were all members of the undergraduate classes on the Evanston campus during the academic year, 1953-54.

### Procedures and Techniques

These men were selected by a group of qualified judges who were intimately acquainted with those who participated in the University's activities program: the Dean of Students, the Dean of Men, and the Director of Student Affairs. Each man was chosen on the basis of the office or position which he held in the co-curricular program and the fact that he was fulfilling the responsibilities of his status as a recognized leader on campus.

A case history approach, which utilized the techniques of personnel records, group meetings, supplementary questionnaires, objective tests, and interviews, was developed for the purpose of collecting information concerning these men. These data were compared with one or more of the following groups: the male students on campus, the Northwestern student body as a whole, a random sample of one hundred Northwestern men, or college norms on standardized instruments.

### Conclusions and Results

The typical or average male student leader at Northwestern, as the product of an urban community, came from a small family group with well-educated parents and an above-average socio-economic status. He had been given the opportunity for personal growth through youth organizations, part-time jobs, summer camp and travel experiences. In high school the typical leader not only ranked high scholastically in his graduating class but he had assumed a role of leadership in high school activities. He possessed superior general intelligence and his academic achievement in college was above the average of the other men on campus.

He was willing to devote his time to college activities because he believed that the practical experience he was receiving from organizational planning and the skills he was developing would have some vocational significance for his future. His college leisure-time activities centered around reading, sports, and social functions, of which the latter have become more important in college than they were in high school. Aspiring vocationally to professional level work, the typical leader was more interested in linguistic, social service, and business occupations than those of a scientific, technical or mechanical nature. His plans for the future included graduate work. Quite active socially, both in high school and college, the typical leader possessed enthusiasm, vitality, and an ease for establishing rapport with others. There was a stability about him that was excelled only by his desire to persuade and lead other people.

Since these findings indicated that the influence of leadership in high school seemed to have a cumulative effect upon leadership in college, it is the responsibility of high school personnel specialists to see that as many students as possible be given an opportunity to experience the role of student leadership. The importance of home and family relationships, leisure-time activities, social contacts, summer camp and travel experiences, part-time jobs, high school activities—all of these must be stressed in a high school guidance program to provide the setting for personal growth and development in leadership potential in terms of the unique abilities, interests and personality characteristics of students.

College personnel workers charged with admission

responsibilities would do well to scrutinize high school records for evidences of past leadership promise; the identification and development of potential leaders should become an important guidance function.

369 pages. \$4.61. Mic 56-105

### A STUDY OF A SELECTED GROUP OF CEREBRAL PALSIED PERSONS TO DETERMINE MINIMAL OCCUPATIONAL PROFILES AND ABILITIES ASSOCIATED WITH VOCATIONAL SUCCESS

(Publication No. 14,584)

Eugene Richards, Ed.D.  
Indiana University, 1955

Chairman: Louis G. Schmidt

### Summary

Cerebral palsy, the result of a brain injury, impairs the abilities of its victims in many different ways and to different degrees. If these people can be aided and guided to the extent that they can find suitable employment, they can achieve the happiness of usefulness and financial independence and are no longer burdens on their family or on society. While no hope is yet in sight of a cure for this malady, prolonged therapy is sometimes helpful and education and social experience are necessary. The total number of cerebral palsied is estimated at half a million, with 10,000 cerebral palsied children being born annually.

This study was undertaken to aid in advancing the solution of the employment problems of cerebral palsied persons. It was desirable to ascertain the relationship between the amount and type of impairment of abilities and the subject's possibility of finding a suitable vocation. In order to accomplish this, the following steps were taken:

1. A rating scale was devised to inventory the disabilities of the cerebral palsied which are associated with and affect employment.
2. Vocational success of the subjects studied was determined in terms of vocational experience.
3. The amount and type of disability suffered by each was compared to the record of vocational success or failure.
4. The differences among cerebral palsied persons were depicted.

It was felt that such a study could provide information of value to educators and counselors in training cerebral palsied children for vocational adjustment in adulthood, in developing their educational program and social experiences, and in guiding the cerebral palsied adults who are striving to make a satisfactory vocational adjustment.

The history, medical aspects, and vocational possibilities of the cerebral palsied were reviewed in the literature.

To accomplish the study an interview guide was constructed, and a convenient group of 25 men and 25 women (adults) suffering from cerebral palsy was interviewed to secure data. The handicaps affecting the possible employment of the cerebral palsied were categorized as hearing, seeing, speaking, walking, using right arm, using left arm, jerking, grimacing, drooling, toileting, eating, and intelligence. These handicaps were rated for each subject as



normal, moderate, or severe. On the basis of their employment record, the vocational adjustment of each subject was rated as satisfactory, intermediate, or unsatisfactory by a "jury of experts"--persons familiar with the vocational problems of the cerebral palsied. Frequency distribution charts were made to describe the group with respect to age, sex, marital status, and education. The degree and type of disability were analyzed and profiles (case summaries) were made up for each subject. Similarity of impairment patterns and frequency of occurrence of type or combination of handicaps were studied and shown in tables. The relation of the type and severity of handicap to the vocational adjustment was studied.

It was found that cerebral palsy does not preclude employment; handicaps in different degrees and areas; and has certain pertinent factors which most often occur. A subject may be normal in some areas, moderately involved in some, and severely involved in others, and there is no definite pattern in the degree and type of involvement which may occur. Men are more successful in attaining satisfactory vocational objectives than are women. There seems to be no particular type of job which these people do--they work at many different things. The handicap which occurs most frequently involves walking and thus affords a major handicap to employment. Satisfactory vocational adjustment is directly related to type and severity of handicap.

It was recommended that: (1) The term cerebral palsy should be used in a general sense because there are so many types and degrees of handicap no one such term can describe a particular individual. (2) Since vocational adjustment in adulthood is of prime importance, education and training should begin in the elementary school, and independence should be encouraged and developed. (3) A vocational plan should be considered for each cerebral palsied person before the termination of his formal schooling. (4) Counselors can aid these people by explaining their abilities to employers; by finding work to be done in the home for those who are unable to leave home to work; by recognizing the employment potential of each of the various types and degrees of handicap; and by seeking unique jobs suited to particular handicaps.

114 pages. \$1.43. Mic 56-106.

#### THE PREDICTION OF SUCCESS IN COLLEGE BASED ON ACHIEVEMENT UNDER A COMPLEX TASK CONDITION

(Publication No. 15,337)

Sol Shael Rosenberg, Ph.D.  
Bradley University, 1955

The purpose of this study was to ascertain whether the measurement of the learning that has taken place under a complex task condition, defined as the simultaneous presentation of diverse types of stimulus materials to two sense modalities, would have value as a procedure for predicting scholastic achievement in college.

The specific questions asked in this study may be stated as follows:

1. Is a measure of the learning that has taken place under a complex task condition related to the scholastic

achievement of college freshmen as measured by their first semester grade point average?

2. Is a measure of the learning that has taken place under a complex task condition related to the scholastic aptitude of the individual as measured by the American Council on Education Psychological Examination for college freshmen?

3. Would a measure of the learning that has taken place under a complex task condition, by itself, or in combination with other variables, permit the prediction of scholastic achievement at an acceptable level of accuracy?

The complex task condition was composed of a silent motion picture entitled "The Three Great Religions of China" and an electrically tape-recorded lecture on "Some Facts about Astronomy", which were presented simultaneously to the experimental subjects. The subjects were asked to learn as much as they could from each of the stimulus materials during their simultaneous presentation. The subjects were then tested on the contents of the two stimulus materials by means of an objective test to determine how much learning had taken place under this condition. The reliability of the Complex Task Test was found to be .837.

The experimental group consisted of 425 members of the freshman class who entered Bradley University in the fall of 1954. One hundred and twenty-five of these cases were placed in a hold out group for the purpose of testing the regression equations derived from the data.

The Pearson  $r$  between C. T. test scores and the criterion of first semester grade point averages was .340. Predictions of grade point average for each member of the hold out group were made and the earned and predicted grade point averages correlated .30.

Further analysis of the C. T. scores as a predictor variable indicated that the C. T. test was able to discriminate beyond the .01 level of confidence between groups of students who are likely to fall in either the upper or lower quarters of their class in grade point average.

Using the Wherry-Doolittle Test Selection method, it was found that a combination of high school rank, ACE L score and C. T. test scores yielded a multiple  $R$  of .588 with the criterion. The earned and predicted grade point average for the hold-out group, using this multiple correlation procedure, correlated .629.

The major findings of this study may be summarized as follows:

1. The measurement of the learning that has taken place under a complex task condition, as a single predictor variable, did not permit prediction of scholastic achievement at an acceptable level of accuracy for this sample.

2. The measurement of the learning that has taken place under a complex task condition appears to be strongly related to scholastic aptitude for this sample.

3. A multiple regression analysis involving high school rank, ACE L score and C. T. test score permitted the prediction of scholastic achievement with a fair degree of accuracy for this sample.

4. High school rank was the best single predictor of scholastic achievement and was largely responsible for the level of prediction achieved by the multiple regression analysis.

104 pages. \$1.30. Mic 56-107

**FACTORS RELATED TO THE ACADEMIC SUCCESS  
OF RESIDENT FRESHMAN MEN AT A MIDWESTERN  
LIBERAL ARTS COLLEGE DURING THE ACADEMIC  
YEAR 1952-1953**

(Publication No. 15,169)

John Adam Wellington, Ph.D.  
Northwestern University, 1955

**The Problem**

The problem of this study was to discover if there were factors, intellectual and non-intellectual, that tended to explain the degree of academic success attained by the resident freshman men who attended a Midwestern Liberal Arts college during the academic year 1952-1953.

**Procedure**

The 86 resident freshman men were classified into groups designated as most successful (15 subjects), successful (15 subjects), unsuccessful (22 subjects), and most unsuccessful (34 subjects). Differences between the groups were studied in each of the following six areas: (1) family background, (2) high school experience, (3) participation in student activities including interscholastic athletics, (4) financial factors, (5) study conditions, and (6) personal-social factors.

Data used in the study consisted of: (1) scores on college entrance tests and the Primary Mental Abilities Test, (2) responses on the Mooney Problem Check List, Form C, (3) interview responses of the subjects to questions posed by the investigator, (4) anecdotal records made by the investigator, faculty, administrators, and staff, (5) personality ratings given by pledge trainers, administrators, faculty, staff, and the investigator, and (6) information in student files in the Offices of the Registrar and the Dean of Students.

**Results**

In order to determine a pattern of factors related to the achievement of academic success the significant differences, those of 15.0 per cent or more, which occurred between the most successful group and the most unsuccessful group in each of the areas investigated were noted. Those significant differences deemed most pertinent will be summarized.

Compared to the academically most unsuccessful men, the academically most successful men were:

1. More likely to do as well academically in the freshman year in college as they did in high school.
2. More likely to make higher scores on the Ohio State Psychological Examination and on the vocabulary and the paragraph sections of the Nelson-Denny Reading Test.
3. More likely to spend from 16 to 20 hours per week in study and to follow a study schedule.
4. Less likely to feel that "Not knowing how to study effectively" and "Not spending enough time in study" were either major or minor problems.
5. Less likely to feel that being "Weak in spelling or grammar," "Slow in reading," and "Slow in mathematics" were either major or minor problems.
6. Less likely to feel that "Fearing failure in college" was either a major or minor problem.
7. More likely to feel that being "Restless at delay in starting life work" was either a major or minor problem.

8. More likely to feel that "Campus lacking in recreational facilities" was either a major or minor problem.

9. More likely to spend at least some time in student activities including interscholastic athletics.

10. Less likely to drink "frequently."

11. More likely to be "highly co-operative" and "social."

12. More likely to be non-fraternity men.

13. Less likely to feel that "Daydreaming" and "Nervousness" were either major or minor problems.

**Conclusions**

The data obtained appeared to justify the following conclusions:

1. There are no simple reasons which explain degree of academic achievement realized by the student.
2. Measures of intellectual factors were better indices of academic success than were measures of non-intellectual factors.
3. Observations of behavior in personal-social factors were better indices of academic achievement than were subjective evaluations by the student.
4. Inadequacies in high school preparation and lack of adequate remedial training were important factors limiting academic achievement in college.
5. Membership in local and national fraternal organizations was a deterrent factor to the achievement of academic success as well as to the development of desirable personal-social characteristics.
6. In all areas studied except "family background" the college was in a position to assist the student according to his individual needs toward the realization of his maximum potential of development.

189 pages. \$2.36. Mic 56-108

**EDUCATION, TEACHER TRAINING**

**INDUSTRIAL ARTS COMPETENCIES NEEDED BY  
ELEMENTARY TEACHERS: A CRITERION STUDY OF  
THE INDUSTRIAL ARTS COMPETENCIES NEEDED  
BY ELEMENTARY TEACHERS WITH IMPLICATIONS  
FOR CURRICULUM DEVELOPMENT FOR THE  
PREPARATION OF ELEMENTARY TEACHERS  
IN THIS AREA**

(Publication No. 14,551)

Robert Dean Brown, Ph.D.  
University of Minnesota, 1955

This study was designed to determine, as accurately as possible, the industrial arts competencies needed by elementary teachers. As a basis for building a college curriculum which would enable them to achieve those competencies, answers to the following questions were sought:

1. In what industrial arts activities do elementary school children presently take part?
2. How frequently is each activity used?



3. Where--and how--were the skills and knowledges inherent in those activities learned by the elementary teacher?
4. What industrial arts activities not now being carried on would it be helpful for the elementary teacher to know about and be able to use?
5. With what basic subject areas are industrial arts activities presently being integrated?

A review of the literature was undertaken as the first phase of the study. It was designed to supply one criterion--that of expert opinion--by which experiences proposed for inclusion in programs of industrial arts education for elementary teachers might be judged for appropriateness.

In the second phase of the study, thirty-five St. Paul elementary schools were randomly selected, and one teacher in each school was sampled by interview. As a result of that first series of interviews, a master list of fifty-eight industrial arts activities being used by the St. Paul teachers sampled was compiled.

In the final phase of the study, an inventory checklist based on the master list of activities was constructed and used to sample all of the teachers in each of the twenty-five graded and ten ungraded, randomly selected, Minnesota elementary schools. Each teacher was asked to answer the following questions about each of the fifty-eight master list industrial arts activities:

1. Do you use this activity?
2. If not, is it a worthwhile activity to use?
3. If you use this activity, how frequently do you use it?
4. If you use this activity, where did you learn it?
5. If you use this activity, with which basic subject area(s) do you integrate it?

Each teacher was also asked to rank, in the order of their importance in his particular situation, four basic reasons why elementary teachers do not make greater use of industrial arts activities.

In a second series of interviews with the St. Paul teachers who were originally sampled, a card sort was employed to obtain data similar to that gathered through the use of the inventory checklist.

The review of the literature provided much valuable information in the following areas:

1. The defining of industrial arts.
2. The objectives of industrial arts.
3. The objectives of industrial arts at the elementary school level.
4. Industrial arts activities.
5. Equipment and supplies needed to carry on a program of elementary school industrial arts.
6. The structure and administration of the elementary school industrial arts program.
7. The integration of industrial arts with basic subject areas.
8. The industrial arts preparation of the elementary teacher.

Statistical analysis of the data revealed the following facts:

1. As regards the general use of industrial arts activities, there is no significant difference in the number of activities carried on by the oldest ten per cent and the youngest ten per cent of the graded and ungraded school teachers sampled.
2. Graded and ungraded school teachers in the samples having the most teaching experience use significantly more industrial arts activities than those having the least teaching experience.
3. There is no significant difference in the number of industrial arts activities carried on by graded and ungraded school teachers sampled who have four years and more of college education and by those who have two years and less of training.

From the literature and from the data gathered, it is evident that the elementary teacher should be possessed of a rather broad fund of industrial arts understandings and general information. He should know, for example, the objectives of industrial arts, and he should be acquainted with a wide variety of industrial arts activities which can be used at the elementary school level. It is equally necessary that he be able to demonstrate effectively manipulative skills and that he be familiar with the sources of supply of industrial arts equipment, tools and materials. It is probable that there is enough content to make desirable an entire college course devoted to teaching its students to carry on intelligently industrial arts work at the elementary school level.

The literature and the data gathered make it clear that there are three broad industrial arts areas within each of which the elementary teacher should develop specific competencies. They are:

1. woodwork
2. the graphic arts
3. the crafts

The specific skills and knowledges which the elementary teacher develops in these areas need not be carried near the point of expertness in any college course. Breadth of skills, rather than depth, is to be desired, for such will make it possible for the elementary teacher to deepen his industrial arts preparation in specific areas through advanced college work, programs of in-service training and on-the-job experience. 350 pages. \$4.38. Mic 56-109

#### LETTERS OF RECOMMENDATION FOR BEGINNING ELEMENTARY SCHOOL TEACHERS

(Publication No. 15,465)

Burdette Wilmont Eagon, Ed.D.  
George Peabody College for Teachers, 1955

Major Professor: J. E. Windrow

The purpose of this study is to learn what factors make letters of recommendation written for beginning elementary

school teachers most effective, and to determine whether or not present letters of recommendation written for beginning elementary school teachers at Wisconsin State College, Stevens Point, are meeting the expectations of employing officials.

A questionnaire was used to discover the opinions and judgments of employing officials concerning the factors that contribute to the effectiveness of letters of recommendation. The instrument was sent to officials who aided in the employment of beginning elementary school teachers through the Bureau of Recommendations. The results of the questionnaire were used as the basis for an analysis of the letters of recommendation written for these teachers. A comparison of the data from the questionnaire and from the letters was made to determine whether present recommendations are meeting the expectations of employing officials.

#### Recommendations

It is realized that effective letters of recommendation are based on subjective human opinions and judgments and can never be infallible. The following recommendations set forth the essential elements necessary if letters of recommendation written for beginning elementary school teachers at Wisconsin State College, Stevens Point, are to be most effective in aiding employing officials in selecting, employing, and assigning teachers who best meet their requirements.

1. Information concerning nineteen defined items should be included in the letters of recommendation contained in a beginning elementary school teacher's credential folder. The items are: intelligence, scholarship, appearance, personal manner, character, emotional stability, health, dependability, diligence, communicative skills, progressiveness, professional attitude, attitude toward self-improvement, relationship with children, teaching ability, classroom management, writer's suggestions for candidate's improvement, writer's knowledge of the candidate, and writer's estimate of the candidate.

2. The Bureau of Recommendations should make known to all writers of recommendations the nineteen defined items employing officials expect to be commented on in letters of recommendation.

3. The Bureau of Recommendations should make known to the various writers of letters of recommendation those items on which they are requested to place special emphasis when relating information about a candidate.

4. The writers of recommendation should familiarize themselves with the nineteen defined items on which employing officials desire comment, particularly those items on which they are requested to place special emphasis.

5. The writers of recommendation should consider it obligatory to acknowledge those items on which they are requested to place special emphasis. If there is a lack of knowledge on the part of the writer pertaining to a particular item, it should be so indicated to avoid any misinterpretation.

6. The Bureau of Recommendations should check the candidate's credential folder to determine that the letters of recommendation as a whole contain information relative to the nineteen items.

7. A letter of self-evaluation based on the nineteen items should be written by the candidate to be included in his credentials.

8. The candidate's credential folder should contain from three to five effective letters of recommendation.

9. The candidate's credential folder should include letters of recommendation from all supervisors of student teaching with whom he has worked, and from the Director of the Bureau of Recommendations.

10. The Bureau of Recommendations should request any additional letters of recommendation necessary to convey adequate information about the candidate.

11. The combination check list and brief letter form should be used by writers of recommendations. The check list should consist of defined items, a rating scale, and space for comment on each item. The brief letter should describe the strengths and weaknesses of the candidate, and any other information which the recommender believes would be of interest to prospective employers.

208 pages. \$2.60. Mic 56-110

#### A STUDY OF THE PROGRAMS FOR THE PREPARATION OF SCIENCE TEACHERS FOR SECONDARY SCHOOLS AT SELECTED COLLEGES AND UNIVERSITIES

(Publication No. 15,142)

Archie Louis Lacey, Ph.D.  
Northwestern University, 1955

#### Purpose of the Study

The purpose of this investigation was to study the programs for the preparation of science teachers at selected teacher-training institutions in the East, Middle West, and South.

The study was predicated upon the assumption that there exists at such institutions a relatively great amount of knowledge concerning methods and techniques of training science teachers, which, if synthesized and communicated, could contribute to the improvement of programs for science teachers at other institutions.

The problem was analyzed as follows: (1) What are the aims and objectives of the programs? (2) How are the programs organized; and what are the policies of recruitment, admission, selection, and guidance of prospective science teachers? (3) What are the curricular content and patterns for general, special and professional education? (4) What facilities are utilized in the training of science teachers? (5) What is the status of graduate training and research in science teaching? (6) Who are the staff members engaged in the preparation of science teachers?

#### Methods and Techniques

Development of Criteria and Selection of Institutions.--Criteria for appraising programs for science teachers were developed by (1) assembling principles relating to science-teacher education into an Inventory of Criteria which was evaluated by the National Association for Research in Science Teaching, and (2) by analyzing the responses of the participants for the utilization of principles accepted by 80 per cent of them as valid criteria.

A total of 53 or 84 per cent of the principles proposed were accepted as valid criteria. The five institutions in



each section which were recommended by most respondents were chosen, along with two others, for visitation.

**The Visitation Studies.**--Instruments derived from the validated criteria were used for collecting data relating to programs by means of (1) interviews with administrators of programs, (2) interviews with staff specialists who teach science teachers, and (3) by recording various features of programs on a comprehensive checklist.

### Findings

In the main, it was discovered that each of the institutions has some superior features in their programs for science teachers. However, a considerable number of problems exist, and there is a distinct lack of standardization among the institutions as a group.

Among the strong features, the findings indicate that (1) most of the institutions have given careful attention to the aims and objectives of science teaching in secondary schools as sources of criteria for formulating their program objectives, (2) that all of the institutions actively seek to attract able students to prepare for science teaching, (3) that the institutions have modified or reorganized various facets of their curricula or are in the process of doing so for the improvement of general, special, and professional education, (4) that the institutions are making more effective use of conventional facilities and have or are in the process of obtaining special facilities designed to improve secondary school science teaching, (5) that they are improving and enriching graduate training and (6) that they are seeking to marshal all institutional resources for the improvement of teacher training in science.

Persistent problems existing in the programs are in the categories of recruitment of prospective science teachers and effective articulation and coordination of institutional resources and services for the improvement of the programs.

A trend toward more standardization among the programs seems to be apparent in the philosophies and opinions of specialists engaged in teaching science teachers but there is not a clear consensus on objectives of teacher training in science at all of the institutions.

### Conclusions

There is consensus on a sufficient number of features discovered in the programs at the institutions visited to serve as guiding principles for modifying or reorganizing other programs. Many methods and techniques found in use are in agreement with the developed criteria whereas, others are not.

The need for more research on the problem of effective training for science teachers is attested by the fact that there is still not a clear consensus on (1) how science teachers can best be prepared, and (2) on what good science teaching is.

339 pages. \$4.24. Mic 56-111

## A STUDY OF THE PROFESSIONAL PROBLEMS OF TEACHERS GRADUATED FROM THE SCHOOL OF EDUCATION OF MIAMI UNIVERSITY FROM 1946 TO 1954

(Publication No. 15,149)

Robert Porter Milheim, Ed.D.  
Northwestern University, 1955

### Purpose of the Study

The purpose of this study was to determine and to analyze the professional problems of teachers graduated from the School of Education of Miami University during the period 1946 to 1954, and to derive conclusions from the findings for the teacher-education program at the institution.

### Method of Research

The data of the study were procured through use of a questionnaire which included items regarding the personal lives of the teachers, their professional preparation, and their teaching experience. The questionnaire also included a list of forty-five problems designed so that the respondent could check in one of three columns the degree of importance which each of the problems listed had for him in his teaching. If the respondent indicated that a problem was "of some importance" or "highly important" to him, he was asked to indicate in one of seven columns the probable source or cause of that problem. The sources printed at the heads of the seven columns were: undergraduate preparation, lack of experience, community factors, teaching load, class size, lack of opportunity for in-service education, and administrative and supervisory policies and practices. The eight hundred sixty-five questionnaires which were returned by graduates with teaching experience comprise the source from which the data were drawn.

### Findings and Conclusions

Within the limitations of this study, and in light of the obtained findings, the following conclusions appear to be valid.

- (1) The ten highest ranking problems reported by the teachers were:
  - (a) Providing for wide range of individual differences.
  - (b) Adapting instructional procedures to the needs of the class.
  - (c) Developing instructional procedures for overcoming children's difficulties.
  - (d) Discovering the interests of children.
  - (e) Selecting materials related to children's abilities.
  - (f) Developing responsibility for self-direction.
  - (g) Maintaining discipline.
  - (h) Developing concepts of social behavior.
  - (i) Securing adequate supplies and equipment.

- (j) Developing ability in children to help in planning.
- (2) The sources of the problems reported by the teachers in order of their importance were: (a) administrative and supervisory policies and practices, (b) lack of experience, (c) class size, (d) community factors, (e) undergraduate preparation, (f) teaching load, and (g) lack of opportunity for in-service education.
  - (3) Three times as many problems were reported by consensus of fifty percent of the men as were reported by an equal proportion of women teachers.
  - (4) Men and women teachers were significantly agreed on the kinds of problems they faced and on the sources of those problems.
  - (5) Marital status was of no significance in determining the number, kinds, and sources of teachers' problems.
  - (6) There was considerable variation in the number of problems reported by fifty percent or more of the teachers in the different fields of preparation.
  - (7) The teachers in the different fields of preparation were in agreement on the highest ranking problems reported by each group, and were significantly agreed on the sources of their problems.
  - (8) Length of teaching experience was of no significance in determining the number, the kinds, and the sources of teachers' problems.
  - (9) There appeared to be an association between dissatisfaction with preparation for teaching and consensus on a greater number of problems.
  - (10) There was agreement among the groups of teachers with different attitudes toward their preparation on the kinds of problems they faced, and significant agreement on the sources of those problems.
  - (11) There appeared to be an association between dissatisfaction with teaching position and consensus on a greater number of problems.
  - (12) The groups of teachers with different attitudes toward their teaching positions tended to agree on the kinds of problems they reported, and were significantly agreed on the sources of their problems.
- 232 pages. \$2.90. Mic 56-112

**PREPARATION, PROBLEMS, AND PRACTICES OF  
MATHEMATICS TEACHERS IN THE NORTH  
CENTRAL HIGH SCHOOLS OF OKLAHOMA**

(Publication No. 15,458)

Vivian Nemecek, Ed.D.  
The University of Oklahoma, 1955

Studies to determine the status of teachers are important in order to provide teacher education institutions, certification and accrediting agencies, professional groups, incumbent teachers and their supervisors, and prospective

teachers and their advisers with information concerning that status and its implications.

This study is concerned with the status of the mathematics teachers employed, during the school year 1953-54, in the 141 Oklahoma high schools accredited by the North Central Association of Colleges and Secondary Schools. Elements of status studied were: (1) their preparation in terms of degrees, major and minor fields of study, and course work and credit in mathematics, professional education courses, and related fields, (2) their principal problems, and (3) their practices in selected areas of teaching. A checklist was sent to all of the mathematics teachers in the schools; one hundred and ninety-five (74 per cent) responded.

The following findings are based on the teachers' responses:

1. The teachers were well prepared in terms of degrees; 80 per cent had earned or were working towards a master's degree and five per cent (all men) were engaged in doctoral work.
2. Ninety-two per cent had either a major or minor in mathematics at the undergraduate level. Thirty per cent of those with an undergraduate major in mathematics continued the study of mathematics to some extent at the graduate level. The principal reason given for the lack of study of graduate mathematics was its remoteness from high school mathematics.
3. Seven out of ten teachers with an undergraduate major in mathematics changed to secondary education or school administration for the master's degree.
4. The median number of semester hours of mathematics and education earned were 29 and 40, respectively, with both ranging from 10 to 80 hours.
5. Study in the related fields of physics, chemistry, and astronomy was rather limited.
6. One out of six teachers reported no courses in the teaching of mathematics; of those who did, 40 per cent felt that the number and scope of the courses were inadequate. Certain topics for these courses were suggested. A majority of the teachers indicated that these courses should be taught by a person dividing his time between the departments of mathematics and education.
7. Their principal problems were related to individual differences of students, teaching load, and extra-curricular activities.
8. The practices of the teachers in selected areas were common and traditional.

The following principal conclusions were stated:

1. The women teachers of the sample appeared to be more stable in the profession than the men.
2. The criterion for choice of subject matter in the fifth year of preparation should be improvement in teaching competency rather than a vertical extension of one or two areas of study brought about by the division of college subject matter into two levels -- undergraduate and graduate.

170 pages. \$2.13. Mic 56-113



**A STUDY OF THE PROBLEMS OF KINDERGARTEN,  
PRIMARY, AND MIDDLE GRADE TEACHERS WHO  
WERE GRADUATED FROM THE SCHOOL OF  
EDUCATION, NORTHWESTERN UNIVERSITY,  
FROM 1951 THROUGH 1954**

(Publication No. 15,153)

Findlay C. Penix, Ph.D.  
Northwestern University, 1955

Chairman: Gail M. Inlow

The purpose of this study was twofold: (1) to identify the problems of the kindergarten, primary, and middle grade teachers who were graduates of The School of Education, Northwestern University, from 1951 through 1954, and (2) to determine possible causes and to examine specifically the relationship of such problems to the teacher-education program in effect at The School of Education during the period of preparation for teaching. The instrument employed for collecting data for this investigation was a questionnaire which was sent to 464 graduates. Two hundred ninety-nine usable replies were received, representing 67.2 per cent of the population originally contacted.

The first ten problems in rank order which were identified as having caused difficulty for all respondents during their first year of teaching regardless of the year of graduation or grade level of teaching were: (1) caring for individual differences, (2) planning and preparing for teaching, (3) maintaining discipline, (4) evaluating and reporting pupil growth, (5) knowledge of grade level texts and materials, (6) class size, (7) school and classroom physical facilities, (8) knowledge of content fields, (9) motivating pupils, and (10) using group processes in the classroom.

An analysis of the data supports the following statements: (1) School problems are not quantitatively related to year of graduation, length of teaching experience, or grade level of teaching. (2) There is little difference in the mean numbers of school problems which relate to factors over which the teacher has little or no control as identified by the several grade level groups and by all first-year teachers. (3) For the teachers of grades one, two, and three, there is a statistically significant difference between the mean number of school problems relating to preparation and school problems outside the teacher's control. (4) Positive and highly significant rank-order coefficients of correlation support the conclusion that there is little difference in the relative importance of problems identified by the first-year teachers of the several grade-level groups. (5) The following were identified as statistically significant problems for various teacher groups: planning and preparing for teaching, caring for individual differences, and evaluating and reporting pupil growth. (6) There is little relationship between the mean number of school problems relating to preparation and the number of undergraduate methods courses completed, the type of student registration in The School of Education, or the pattern of student teaching. (7) School problems relating to factors over which the teacher has little or no control appear to have a significant relationship to the degree of job satisfaction experienced by the teachers.

Certain conclusions of the study are: (1) Although there is considerable difference between and among the groups of teachers as to the importance of any one problem which was reported as having caused difficulty in teaching, the

most frequently reported problems are related to the teaching-learning processes. (2) Some problems of difficulty which were identified by the graduates show a direct relationship to factors inherent in particular teaching situations. In most cases, these problems seemed to be outside the teacher's control. (3) The participating graduates identified few problems of a personal nature. (4) The problems encountered by the teachers of different grade levels appear to be similar in kind but somewhat different in relative importance for the nursery school-kindergarten teachers. (5) Some problems which were experienced during the first year of teaching tended to persist despite additional years of teaching experience. Notable among these were the problems of caring for individual differences and evaluating and reporting pupil growth.

265 pages. \$3.31. Mic 56-114

**PERSONAL CHARACTERISTICS OF SOME  
SUCCESSFUL MUSIC TEACHERS IN ERIE  
COUNTY, NEW YORK**

(Publication No. 15,156)

Vincent Joseph Picerno, Ed.D.  
Northwestern University, 1955

Purpose

The purpose of this study was to determine the nature and extent of some identifiable factors that may contribute to success in teaching music in public schools.

Method

To secure data for this study a total of fifty-nine music teachers from Erie County, New York, were selected to participate. This group was a representative sample of the total population of music teachers who were members of the Erie County Music Educators Association. A reliable jury of ten members placed these teachers in one of three categories: superior teachers, average teachers, and below-average teachers. The teachers were studied by investigating the interrelationship of some selected elements as: (a) the teacher's attitude toward teaching as determined by the Minnesota Teacher Attitude Inventory, (b) the amount and kind of training, both quantitative and qualitative, (c) the number of years of experience in teaching, (d) the teacher's success in teaching as determined by a selected and reliable jury, (e) the general background of the teacher as determined by a modified case history approach involving a questionnaire, (f) observation and interview for the purpose of validating and supplementing the questionnaire, and also as a basis for rating the fifty-nine music teachers. Data were also gathered from students, teachers, and administrators as to what criteria might be used to evaluate teachers.

Results

From the results of the study it might be assumed that the successful teacher does have a distinct personality different from that of a below-average teacher. This does not mean that a successful teacher possesses one distinct

or stereotyped personality, but that when a general pattern of favorable personality traits emerges, a person enjoying those traits might have probable success in most teaching environments.

### Conclusions

The general conclusions indicate some personal characteristics of the successful teachers in terms of personal background, attitudes toward children and adults, and in general, the development of the teacher. The superior teachers indicated that in comparison with the other groups they: (1) came from families of higher income, (2) had parents who received more education than the parents of the average teacher, (3) came from larger families, (4) were active during youth and became active in and held more offices in social and professional organizations throughout their teaching career, (5) had a higher academic standing in college and held more honors in college, (6) held a greater number of Master degrees, (7) indicated a greater interest in their job, (8) were more willing to make decisions, (9) were more interested in participating in activities that involve other people. It was also indicated that more of the superior teachers were married and had larger families.

Almost no relationship existed between the judges' ratings of the teachers and, (1) the years of higher education, (2) the years of teaching experience, and (3) the raw scores of the Minnesota Teacher Attitude Inventory. This would show that these three items are not as important in indicating probable teaching success as is generally assumed.

It was indicated that most factors involved in rating the superior teacher related to human relationships. From this it would seem that a person striving to be a successful teacher should develop those characteristics that foster better human understanding.

253 pages. \$3.16. Mic 56-115

### **A SYNTHESIS OF THE EXPERIMENTAL EVIDENCE ON SUBJECT MATTER READINESS ORGANIZATIONS INCLUDED AS AN INTEGRAL PART OF THE INSTRUCTIONAL PROCESS**

(Publication No. 14,622)

James Harold Seeney, Ed.D.  
University of Missouri, 1955

Major Adviser: Ralph K. Watkins

**Purpose:** The purpose of this study is to synthesize the experimental evidence on subject matter readiness organizations included in instructional processes on the secondary school level.

**Method of Research:** The data in this investigation were obtained from selected experiments involving the instructional process in which two arrangements of the same subject matter were compared for gains in subject matter achievement and other learnings. Criteria based on a theory of structuring subject matter according to the needs and the experiences of the learner were developed to assess the readiness in a structure of subject matter. The

criteria consisted of two arbitrarily scaled instruments. The first, designated as the need instrument, is based on the assumption that functionally arranged subject matters may be placed upon a continuum corresponding to the probability of awareness or intensity of need of the learner for a particular arrangement of subject matter. The second, the experience instrument, is based on the assumption that there are levels of experiencing subject matter as far as the readiness of the learner is concerned. Readiness was assigned experimental structures of subject matter according to increase in need, increase in experience, and increase in need and experience over the compared structure with the same subject matter. The psychological implications were inferred from the nature of the increase in readiness in the experimental structure and the gains in subject matter achievement resulting from that increase. The extent to which the subject matter arranged functionally within the instructional process supported the philosophical goals of the secondary school was inferred from the learning gains other than subject matter achievement with experimental readiness organizations.

### **Conclusions:**

1. The evidence on subject matter achievement supports the assumption that a readiness organization approach to structuring subject matter within the instructional process is valid.

2. The evidence on subject matter achievement supports the assumption that subject matter structured according to needs and experiences of the pupil does produce increased subject matter achievement.

3. The evidence on subject matter achievement and other learning gains tends to support the assumption that functional arrangements of subject matter provide for growth toward the philosophical goals.

4. The evidence on subject matter achievement and other learning gains does not generally support the assumption that a particular readiness organization implies increased learnings for pupils of all levels of ability.

5. There is considerable evidence to show that subject matter structures based on the following psychological principles produce increased subject matter achievement:  
The pupil learns better if the subject matter is:

- a. structured nearer to the direct level of experiencing.
- b. structured according to an analysis of the way pupils learn the subject matter generally.
- c. structured in accordance with the pupil's experiential level.
- d. structured so that the pupil acquires experiences which help him to understand the material.
- e. structured in amount according to the pupil's ability.
- f. structured so that the total organism participates in the learning.
- g. structured so that the pupil interacts with the subject matter more efficiently.
- h. structured by wholes rather than in fragmentary parts.
- i. structured so that the pupil uses the material.



j. structured so that the pupil has some immediate tension for the material.

k. structured functionally for him.

6. The evidence on subject matter achievement and other learning gains supports the validity of the instruments used in this study to determine the apparent readiness in a subject matter arrangement in the instructional process.

#### Recommendations:

1. Subject matter in the instructional process should be structured in accordance with readiness principles.
2. Teachers should base their teaching on the guidance of learning activities which carry the subject matter.
3. Teachers should consider the way the pupil interacts with the subject matter in the instructional process.
4. Teachers should be more venturesome in arranging subject matter for readiness without fear of achievement losses.
5. The readiness approach should be used as a basis for continued research for the improvement of instruction.
6. Prospective teachers should have more experience in arranging readiness organizations for instruction.
7. Producers of subject matter organizations should consider the many arrangements by which subject matter may be structured.

385 pages. \$4.81. Mic 56-116

### DEVELOPMENT OF AN ENRICHED VISUAL MATERIALS PROGRAM FOR THE BEGINNING COLLEGE COURSE IN THE TEACHING OF READING

(Publication No. 15,304)

Stanley Smith Stahl, Jr., Ed.D.  
University of Maryland, 1955

Supervisor: Professor Alvin W. Schindler

The teacher who is responsible for the success of a reading program has a large, formidable task and must have thoroughly mastered the intricacies and complexities of the reading process. That teachers do not always master these concepts is given by many authorities as one of the causes why pupils may fail in reading. This vitalness of the teacher's skill is cause for concern as to the type and quality of preparation given to the teacher.

The major purpose of this study was to develop a program on the teaching of reading for undergraduate student-teachers that would incorporate maximum use of those visual materials which facilitate understanding of reading instruction.

The procedure followed for this study included six main facets, namely, (1) development of a reading course outline, (2) identification of commercially available visual aids for teaching reading, (3) evaluation of the potentialities of the available visual aids through a limited student procedure, (4) integration of those selected aids into the reading course, (5) construction of supplemental aids to fill in the gaps left by commercial aids and (6) limited application of the visually enriched course in a classroom situation.

Two major bodies of information resulted from the

completion of the steps followed in the procedure. These include (1) a comprehensive manual listing commercially available aids for the teaching of reading and (2) a reading course incorporating the instructional tasks with selected aids integrated to illustrate the concepts to complete those tasks.

Although there are many excellent indexes which list types of commercially available visual materials, a need has existed for a single listing of all types of visual aids, completely described and categorized. The manual resulting from this study is comprehensive and will be a valuable source for the person desiring information concerning a needed aid. Over 2000 separate aids are listed and described as to purpose, source, cost and suggested grade level.

The resulting enriched reading course has already proven its value in a class situation through which typical college students showed commendable mastery of concepts upon completing the course. In addition to the stimulating and motivating factors, the visual aids used brought experiences to the classroom that would have been difficult, if not impossible, to obtain otherwise.

In summary, the visually enriched course is submitted as a planned guide for conducting the beginning college course in the teaching of reading, with the implication that the techniques utilized in its formation might well be followed in setting up similar courses in other college methods courses.

253 pages. \$3.16. Mic 56-117

### EDUCATION, THEORY AND PRACTICE

#### A STUDY OF THE PROCEDURES USED AND THE PROBLEMS ENCOUNTERED IN PROMOTING GROWTH FOR INITIAL READING

(Publication No. 14,594)

Robert Franklin Alsup, Ed.D.  
University of Missouri, 1955

Major Adviser: A. Sterl Artley

Purpose: To determine the procedures first grade teachers use and the problems they encounter in promoting growth for initial reading.

Method of Research: The personal interview was used to interview sixty first grade teachers in certain public schools of Missouri. This study was centered around the procedures teachers used and the problems they encountered in promoting growth in the areas of physical readiness, mental readiness, social-emotional readiness, and educational readiness.

#### Summary:

1. Procedures used by first grade teachers in promoting growth for initial reading.
  - a. Percentage of teachers who reported procedures used in the readiness program.



- (1). Sixty-six and six-tenths per cent reported visual screening of all children.
- (2). Thirty and three-tenths per cent reported auditory screening of all children.
- (3). Seventy per cent used intelligence tests.
- (4). Ninety-one and seven-tenths per cent used parent-teacher conferences.
- (5). Ninety-six and seven-tenths per cent used basic readiness materials.
- (6). Sixty per cent used phonics work books.
- (7). Ninety-eight and three-tenths per cent used grouping.
- (8). Eighty-three and one-tenth per cent used three groups.
- (9). Seventy-six and seven-tenths per cent used a readiness program of six weeks for the accelerated group.
- (10). Seventy-five per cent used standardized readiness tests.

#### Conclusions:

1. Teachers interviewed in this study were making practical use of many of the findings of research in the area of reading readiness. The phases of the program that were especially strong were:
  - a. Use of basic readiness materials.
  - b. Use of grouping.
  - c. Use of readiness tests.
  - d. Use of an extended readiness program for slow learning children.
  - e. Requirement of physical examination for entrance to first grade.
  - f. Use of parent-teacher conferences.
  - g. Use of visual and auditory discrimination activities.
  - h. Use of literature in program.
2. Phases that appear to present weaknesses in the existing program:
  - a. Inadequacy of visual and auditory screening.
  - b. Lack of understanding of effective use of intelligence test data.
  - c. Lack of an enriched readiness program for accelerated learners.
  - d. Lack of understanding of procedures to use in helping child adjust socially and emotionally to school situation.
3. Problems encountered in promoting growth for initial reading:
  - a. Difficulties in promoting independent work habits.
  - b. Failure to help the child to overcome emotional and social difficulties.
  - c. Concern over problems created by overcrowding in first grade classrooms.
  - d. Inability to relate phonics program with basic readiness program.
  - e. Difficulties in locating suitable materials to supplement basic readiness program.
  - f. Concern over the problem of helping the child who is ambidextrous to establish hand preference.
  - g. Difficulties in helping the immature child in visual and auditory discrimination.
  - h. Concern over helping parents of the slow learning child to realize that an extended readiness program is necessary for their child.
4. Though intelligence testing is being carried out in a large number of first grade rooms of the teachers interviewed, the data derived from these tests were not being used to the maximum advantage in the readiness program.

#### Implications:

1. It would seem that more emphasis should be placed on certain phases of the readiness program in professional courses in teacher training institutions.
2. This study points to the need for greater understanding of the facts and principles of child growth and development.
3. The length of the reading readiness period should be more adequately adjusted to fit the needs of the learner. For the most part the accelerated learners will need a short program devoted to activities purely of a readiness nature while slow learners will require a prolonged program of readiness activities before systematic reading instruction is initiated.

189 pages. \$2.36. Mic 56-118

#### AN EXPERIMENTAL STUDY OF TEACHING METHODS IN A COLLEGE FRESHMAN ORIENTATION COURSE

(Publication No. 15,340)

Harold Reynolds Burke, Ed.D.  
Boston University School of Education, 1955

The study was conducted at Boston University College of Business Administration and ran for 20 teaching weeks within a course designed to help students adjust to college living and to augment educational-vocational planning. 250 male students were divided into Experimental and Control groups of 125 students; each group contained 4 class sections. In the Experimental group class sections were organized in a cooperative - group pattern where students joined permanent, small work groups of 4 to 7 students each. Plans for course content and classroom procedures were shared with students through Steering Committees. Each class was sub-divided into 6 work groups; each work group named a chairman, secretary and steering committee representative.



In the Control group a class-whole pattern of organization existed with the class being the smallest unit of organization. The instructor assumed a central position and handled directly plans for course coverage and classroom procedures. Goals were set by the instructor; no effort was made to develop small-group cohesiveness; the instructor participated actively in class discussion; interaction between students and the instructor was encouraged; students contributed to class discussions; the instructor determined and controlled class activities; student experience was accepted but was held secondary to the primary goal of course coverage; tests and grading were handled by the instructor; there was no ongoing evaluation by students of course progress; the instructor prepared and presented reports on topics related for course content.

In the Experimental group immediate course goals were set by students; efforts were made to develop small-group cohesiveness; active student participation and interaction were encouraged; students were free to contribute to class discussions; student experiences were shared; tests and grading were discussed openly; there was continuous evaluation of course progress; students prepared and presented reports on topics related to course content.

Results of the two teaching methods were treated statistically. Scores were compared of tests administered for: orientation course grades, total grade-point indexes (excluding grades made in the orientation course), participation in social activities, leadership experiences, participation on athletic teams, counseling interviews, class attendance, personal problems, academic adjustment, social and emotional integration, course evaluation and instructor evaluation. 22 tests were used for raw data. Scores on 69 test items were compared - 33 for pre-experiment analysis and 36 for post-experiment analysis. 26 items appeared as repeated measures. Measures used singly (age, intelligence, reading ability, grade-point index, course grades, attendance, social participation, counseling) were treated as analysis of variance problems; items used twice as before and after measures (personal adjustment, academic adjustment, problem identification, course and instructor evaluation) were treated by means of the formula listed below. F-ratios and T-ratios indicated extent of differences in performances of Experimental and Control groups. F-ratios were computed by dividing the Mean Square between groups by the Mean Square within groups. T-ratios were computed by using the formula:

$$T = C \frac{\text{SUM } dI - \text{SUM } d2}{\sqrt{\frac{\text{SUM } x^2 A + \text{SUM } x^2 B - 2 \text{SUM } x A x B - \left[ \frac{(\text{SUM } dI)^2}{n} + \frac{(\text{SUM } d2)^2}{n} \right]}}}$$

Significant F-ratios resulted on four items: 1) mid-semester examination for the first semester favored the Experimental group at the .01 level; 2) mid-semester examination for the second semester favored the Control group at the .01 level; 3) total course grades for second semester favored Control group at the .05 level; 4) grade-point index for second semester favored Control group at the .05 level of significance. Remaining F-ratios and all T-ratios showed no significant differences at .01 or .05 levels.

The results suggest that teaching methods have limited effect on adjustive behavior. Social, emotional and academic adjustments are as likely to occur under an

instructor-centered approach as under a student-centered approach. Evidence indicates that either pattern may be used with equal confidence. Causal factors in college adjustments appear not to rest in instructional methods. Fears, hopes, ambitions, interests may reflect more accurately the motivating influences in college adjustment than do instructional devices and procedures. There is a possibility that the instructor-centered method may produce better results where recognition and recall of factual information are desired; however, the idea must be treated cautiously because of the statistical odds favoring the chance appearance of significant scores in the study. The results also suggest that the instructor should feel free to choose the method which better suits his personal interests and skills.

233 pages. \$2.91. Mic 56-119

### A SUGGESTED SCHOOL CAMPING PROGRAM FOR KANAWHA COUNTY SIXTH GRADE

(Publication No. 15,464)

Arnold Clyde Craddock, Ed.D.

George Peabody College for Teachers, 1955

Major Professor: R. T. DeWitt

The purpose of this study was to determine whether school camping as an integral part of the curriculum will aid Kanawha County, West Virginia, in achieving the established educational goals. The study involved (1) analysis of better school camping programs, (2) analysis of the Kanawha County school program, (3) comparison of the degree of success in attainment of common goals, and (4) proposing a camping program for Kanawha County if the need was found to exist.

Letters were written to sources in all states to locate school camping programs in operation. Questionnaires were sent to camp and school personnel in several states to evaluate learning experiences provided in the camping program. Checklists were sent to Kanawha County teachers and parents, and the manual-program and the classroom-program were carefully analyzed to determine whether a camping program was needed and desired.

### Findings of the Study

Kanawha County is an industrial urban area containing a population of over 250,000. In recent years the population has grown rapidly. Schools are exceedingly crowded. Much city, county, and state owned land and facilities are available to the schools of Kanawha County, but few outdoor experiences are provided.

Social changes of recent decades have created urgent needs for camping experiences. These needs have grown out of the urbanization of society with accompanying tensions, pressures, and separation from basic resources of human life. Educators have concluded that camping is the answer to many of their problems; that enrichment of the educative environment can be achieved through the school camping program. During the past decade nearly 200 public school systems have established camping as part of their curriculum. Michigan is taking the lead with about



100 such programs in operation. The common reasons given for camping programs were:

1. To provide meaningful firsthand experiences.
2. To permit children to live together democratically.
3. To provide a children's community with community problems, privileges, and responsibilities.
4. To broaden interests and develop new interests.
5. To help children establish status and gain a sense of belonging.
6. To provide for better pupil-teacher relationships.
7. To help children develop independence.
8. To provide variety and adventurous living.
9. To provide good wholesome fun.

During the past decade Kanawha County teachers have been actively engaged in a curriculum revision program. Curriculum guides and manuals have been prepared in all subject areas. Responses to checklists sent to teachers and parents indicated philosophy and objectives in the manuals are adequate, but the experiences being provided are lacking. Teachers and parents were in agreement both on the need for camping and choice of the sixth grade level.

#### The Suggested Program

Due to the teachers' concern about integration of camping and classroom experiences, the suggested program was composed of before-camp, at-camp, and after-camp experiences. The program should be cooperatively planned as an integral part of the total curriculum. Suggested experiences should be organized around the subject areas set up in the manuals. Some administrative problems involved relate to securing public interest and cooperation, space and facilities, program planning, competent personnel, health and safety needs, legal problems, financing, and evaluating.

There is much evidence that camping experiences would greatly enhance attainment of many of the Kanawha County school objectives. Parents and teachers feel that there is need for camping in the curriculum. Camping services should be provided for the sixth grade. The program should be cooperatively planned, and should include only those learnings which cannot be promoted as well elsewhere. In-service preparation should begin immediately through workshops, pilot projects, and other means.

304 pages. \$3.80. Mic 56-120

#### PARENT-TEACHER CONFERENCES: A DESCRIPTIVE ANALYSIS OF THIRTY-NINE CONFERENCES REPORTING PUPIL PROGRESS IN LIEU OF REPORT CARDS

(Publication No. 15,343)

Melvin Willard Gipe, Ed.D.  
Stanford University, 1955

#### Statement of the Problem

This study undertakes to answer the following questions:

1. What kinds of information are exchanged in these conferences?
2. How much information of these various kinds is exchanged?
3. What are the patterns of communication between parent and teacher?
4. How long are the actual conferences?
5. How do the first conferences differ from the second conferences?
6. How do the primary conferences differ from those in the upper grades?
7. How much information might be exchanged through other media?

#### Procedures and Methods

The conferences were recorded in one elementary school where conferences were the only method of reporting used throughout the year.

Protocols of seven conferences were submitted to three judges to establish topical units. The 736 topical units were re-submitted to the judges for independent assignment to the most appropriate categories. Agreements among the paired judgments ranged from 72.5 to 82.5 per cent.

#### Results

All material in the conferences was assigned to ten categories: Family Milieu, Child in the Home, Child in the Neighborhood, Previous School Experiences, Health or Physical Handicaps, Behavior Characteristics, Procedures and Curriculum, Scholastic Achievement, Peer Relationships, and Not Classified.

With the "amount" of information expressed as a percentage of the total number of words spoken during the conferences, the median percentages were: Scholastic Achievement, 25.7; Behavior Characteristics, 17.0; Family Milieu, 9.4; Procedures and Curriculum, 9.2; Child in the Home, 8.2. Medians of less than 4.0 per cent were obtained for Peer Relationships, Health or Physical Handicaps, Previous School Experience, and Child in the Neighborhood. Median for Not Classified was 6.8 per cent.

Median of teacher-talk was 63.6 per cent; the median of paired responses, 39. Median length of the conferences was 21.0 minutes. The only difference significant at the .05 level between the first and second conferences was in the Previous School Experience category; there was very little such material in the second conferences. Differences



were not significant at the .05 level for any of the comparisons between the primary and the upper grades. General information was isolated in the Procedures and Curriculum category with medians of 9.2 and 9.4 per cent for the first and second conferences.

### Conclusions

1. Although the primary purpose of the conferences is to report pupil progress in academic and social growth, such direct evaluations are couched in much anecdotal and background material.

2. Approximately 25 per cent of the conference material is devoted to a direct evaluation of scholastic achievement with descriptions of behavior, family background, school procedures and curriculum, and the child's reactions to home situations assuming importance, in that order. Material involving the child's relationships with peers at school and in the neighborhood, his health and his previous school experiences is important in individual cases, but not in considering the conferences as a group.

3. Teachers as a group are apt to out-talk parents two to one in such conferences. The best clue to the teacher's concept of her role in such conference situations probably is in the combination of how much she talks and how willing she is to let the parent talk.

4. Thirty minutes is generally an adequate time allowance for such conferences but flexibility must be maintained.

5. The only difference significant at the .05 level between the first and second conferences evident in this kind of an analysis is in the absence of previous school experience material in the second conferences.

6. There are no differences significant at the .05 level evident in this kind of an analysis between the conferences conducted for the primary grades and those conducted for the upper elementary grades.

7. Approximately 10 per cent of the conference material concerned procedures and curriculum matters that could be exchanged through other media.

180 pages. \$2.25. Mic 56-121

## THE NATURE AND DERIVATION OF YOUNG CHILDREN'S SOCIAL CONCEPTS

(Publication No. 15,136)

Charlotte Stephen Huck, Ph.D.  
Northwestern University, 1955

Adviser: Dr. Harold G. Shane

The problem. The purpose of this study was to determine the nature and amount of information possessed by suburban children in the first grade with respect to certain areas of the social studies. The level of understanding evinced for each social concept was determined, as were the sources from which the children claimed they had derived their information.

The procedure. The information and the stated sources of information were obtained during individual and private interviews with 114 suburban children from five first-grade

classrooms in the public schools. An interview-form was devised which consisted of questions concerning seventy-five concepts. There were three questions per concept, so each child was asked to respond to 225 questions during at least two interviews. Besides verbal questions, pictures and objects were utilized in order to make the interviews more interesting and varied.

The concepts investigated covered eight different categories: namely, political, economic, sociological, technological, geographical, historical, cultural, and recreational. The information possessed by the boys for each of these categories was compared to that of the girls. Correlations were determined between the scores obtained for each of these categories and the intelligence quotients of the children.

Four different levels of understanding were designated on the basis of the number of correct responses given to the three sub-questions for each concept. Thus, a score of zero through three could be obtained on each concept. The percentage of children attaining each level of understanding for all concepts was determined.

The sources of information for fifty-one concepts were investigated. The sources were categorized under five major headings; namely, Family and others, Mass media, Contacts, Schools, and Source unknown, and seventeen minor headings. The percentage of responses for each of these sources was computed.

The qualitative aspects of the sources also were determined by comparing the levels of understanding attained for each concept with the stated sources of information. Thus, the sources which provided for the most responses of the third level of understanding, called the extensional level, were considered to be the most accurate sources.

### Major findings and conclusions.

1. Children from suburban first grades possessed considerable information concerning the selected social concepts. An average of 66 per cent of the responses to all the questions of the interview-form were answered correctly.
2. The children excelled in their information concerning recreational and technological information.
3. The boys' scores were consistently superior to the girls', with the exception of the sociological questions on which the percentages of correct responses were identical.
4. Correlations between the intelligence quotients and the scores obtained by the children in each of the eight categories and the total interview-form were positive and low. Thus, the most intelligent child is not necessarily the most informed child, and vice versa.
5. The most important major classification of sources, both quantitatively and qualitatively, was that of contacts. This classification accounted for more responses than any other source and also for the most responses of the extensional level.
6. The classification, mass media, was the second most important major source, providing information for one-fourth of the responses.
7. The most important minor source of information



was that of direct contact, accounting for 19.4 per cent of the responses.

8. Television accounted for 19 per cent of the responses. This was twice the number received by parents.
9. The classification, schools, was the least important source of information for these young children.

Space limitations preclude the presentation of the other findings and implications for the school curriculum which were reported by this study and totaled some forty-seven in number.

319 pages. \$3.99. Mic 56-122

#### THE VIEWS OF SELECTED AMERICAN HISTORIANS ON ISSUES BEARING UPON THE TEACHING OF HISTORY

(Publication No. 14,469)

Katharine Garza Jones, Ph.D.  
The Ohio State University, 1955

This study is primarily an inquiry into the ideas of distinguished American historians concerning the study and teaching of history in the secondary schools of this country. In order to select for detailed study distinguished representatives of the historian's craft, three professional historians were asked to prepare independent lists of names which, in their judgment, could not be omitted from the roll of outstanding American historians. By selecting from among the names on the lists the five historians who were still, or had most recently been, active in their profession, the writer arrived at the following group as subjects for the present study: Albert Busnell Hart, Carl L. Becker, Charles A. Beard, Arthur M. Schlesinger, and Allan Nevins.

The two chief aims of the study were (1) to ascertain, for whatever use or interest they may have among people concerned about high school teaching, the views of these five eminent historians on the teaching of history; and (2) to reach a judgment as to whether there is sufficient uniformity among their views to suggest the existence of a distinctive "historians' point of view" toward the teaching of history.

While the significance of the study in no sense depends upon its relevance to the present atmosphere of heated criticism of public education, it inescapably has bearing upon and is influenced by that atmosphere. It is addressed directly to only one line of criticism, that which contends that public schools have increasingly become non-intellectual or anti-intellectual, and that this state of affairs results from leaving the development of school curricula largely in the hands of professional educationists rather than in those of scholars from the conventional subject-matter fields. The present inquiry is designed to shed light upon the validity of this line of criticism, so far as history is concerned.

After setting forth the views on the teaching of history expressed by each of the five historians, the study sums up the apparent position of each man upon each of the following persistent and widely debated issues:

1. Should American youth study American history only, or should they study American history plus world or European history?
2. Should history be required in the schools rather than merely made available?
3. Should the study of history be strongly urged for all students in the nation's schools or only for those who are expected to become "leaders"?
4. Should history be maintained in the school curriculum as an organized discipline, or should its content merely be employed in contributing to the understanding of social problems being studied under some other curricular arrangement?
5. Are controversial issues best understood by pursuing a chronological study of history which reveals their past forms clearly and to some extent outlines their present forms; or are they best understood by a direct consideration of the current aspects of the issues, with historical background brought in only when it is clearly necessary for understanding?
6. Is history most effectively learned by starting with a detailed study of a limited period or area or by beginning with a general survey of a broad area or time span?
7. Should young students become familiar with the content of history through casual and unorganized experiences before attempting a systematic study of history?
8. Should the history teacher or the writer of history textbooks rigorously confine himself to material he has found to be true, or should he sometimes depart from this principle for the purpose of strengthening the loyalty of people to their country or of unifying them?
9. Should history be studied for its own sake as well as for the purpose of throwing light upon the present scene?
10. Should the preparation of teachers in the field of history consist principally of pedagogical training or of instruction in the subject field to be taught?
11. Should the nature of the history curriculum in the schools be decided by specialists in the field of education, or should such decisions be made primarily by historians?

The study concludes with the finding that there is no necessary agreement upon these issues among competent historians, and that no such thing exists as a "historians' distinctive point of view" toward the teaching of history. Such agreements as do emerge are at the level of vague abstraction and would probably be endorsed by almost anyone. So far as specific school practices or organizations of content are concerned, the issues which divide high school teachers and administrators, professors of education, and members of the general public seem also to divide historians from one another.

284 pages. \$3.55. Mic 56-123



# EDUCATIONAL PHILOSOPHIES IN COLLEGIATE GENERAL EDUCATION

(Publication No. 15,350)

Gerald Edmund McDonald, Ed.D.  
Stanford University, 1955

This study is undertaken to determine the extent to which administrators responsible for the direction of their respective general education programs can receive consistent guidance from their philosophy of education. Likewise, this study is undertaken to determine the nature of whatever philosophy they uphold. Specifically the study is designed to answer three major questions: 1. What is the system or school of philosophy of administrators which their stated position in epistemology implies? 2. How consistent with the characteristic views of that philosophy in one or more areas are the philosophical reasons or assumptions which administrators choose for upholding their general education practices? 3. Is the philosophy which is implied in the philosophical reasons which administrators choose a systematic or an eclectic philosophy?

**Procedure:** Certain general education practices were selected from the literature on general education. These practices pertain to the aims, the curriculum and the instructional procedures of collegiate general education programs. Philosophical assumptions from Experimentalism, Aristotelianism, Neo-Realism, Scholasticism, and Idealism were composed for each practice. These general education practices together with their philosophical assumptions were placed in a check list so that administrators in Colleges A, B, C, D and E might first choose those practices which are acceptable to them and then one philosophical reason for upholding each practice. When the check list was answered, the philosophical assumption chosen by the administrators for the practice which pertains to the ultimate aim of general education was identified with the philosophy of man and the epistemology of the system of philosophy from which it came. Since this initial choice was deliberately framed to be representative of only one system of philosophy, the administrators, in effect, made a choice of one system of philosophy. Where a key administrator was appointed by the President of a College to answer, his choice was treated as an individual choice; where several administrators within a college expressed majority agreement on their initial choice, their choice was treated as a group choice. This initial choice was then expanded into the two areas of epistemology and the philosophy of man and used as criteria to judge the consistency or inconsistency of the administrators' successive philosophical choices in the check list. Since the successive choices were purposely devised to relate to epistemology and the philosophy of man, they were judged to be consistent (or inconsistent) when they were viewed to be consistent (or inconsistent) with one of the major areas (i.e., epistemology or philosophy of man) within the administrator's chosen philosophical system. In this manner the extent to which administrators are able to receive consistent guidance from their philosophy of education was determined.

**Results:** 1) The appointed administrators in Colleges A and B chose Experimentalism; the administrators in Colleges C and D chose Scholasticism while the appointed administrator in College E chose Idealism.

2) With the exception of the administrator in College E, the administrators in the other Colleges showed that they can receive comprehensively consistent guidance

from their chosen philosophical system. Consequently, these administrators possess a powerful means which they could use in achieving effective direction and control of their respective general education programs.

Very likely the following generalizations derived from conclusions in this study apply to administrators in other Colleges.

1. Administrators upholding the philosophy of Scholasticism are especially capable of receiving consistent guidance from general philosophy.

2. Administrators upholding the philosophy of Scholasticism are far less capable of receiving consistent guidance from applied philosophy or educational theory.

3. Administrators upholding the philosophy of Experimentalism are especially capable of receiving consistent guidance from both general and applied philosophy.

4. Administrators who manifest an eclecticism in philosophy (of the type manifested by the administrator in College E) cannot receive consistent philosophical guidance.

249 pages. \$3.11. Mic 56-124

# A SURVEY OF THE CONTRIBUTION MADE TO EDUCATION BY THE NON-GOVERNMENTAL HOSPITALS OF THE DISTRICT OF COLUMBIA

(Publication No. 15,309)

Edna Heckman Treasure, Ed.D.  
University of Maryland, 1955

Supervisor: Professor Gladys A. Wiggin

Twelve hypotheses were formulated which relate to the educational function of non-governmental hospitals on a voluntary basis.

A survey was made of eleven such hospitals in the District of Columbia in an attempt to ascertain the extent of their work in the education and/or training of medical and para-medical workers.

This survey report contains a significant body of facts which were compiled following personal interviews with the administrators in all cases and other administrative personnel in eight hospitals.

The study reveals the scope of the educational function for a period of "the last fiscal year" in these eleven institutions.

The hospitals surveyed were Institutional Members of the American Hospital Association and had been surveyed and approved by the Joint Commission on the Accreditation of Hospitals.

It was found that in addition to the various approved opportunities for students in these specific hospitals there were a number of assignments arranged as affiliations whereby the student on a temporary basis had access to additional clinical material, thus enriching his experience.

A total of 1,308 students were reported in 18 formal programs in addition to great activity in volunteer training, in-service education, attendance at and sponsoring of miscellaneous institutes, workshops, conferences, and professional meetings. All hospitals reported in-service, on-the-job, and/or vestibule training especially in the service departments.

Many items chargeable to education were absorbed in



other expense, e.g., "administrative expense," Out-Patient Department, Medical and Surgical Department, and other departmental classifications. For this reason the total cost of the educational endeavor could not be computed.

It was shown that additional personnel were employed and additional physical facilities were maintained in order to carry the responsibility of educating doctors, dentists, nurses, and other members of the health team.

Perquisites of room, board, laundry, and uniforms were furnished to these students in addition to the cash stipends which many of them received. Health programs for students and/or trainees were reported in ten of these hospitals.

Faculty salaries were paid in four hospitals in addition to fees for collegiate instruction of students. The basic professional program of a university school of nursing had a separate budget of \$161,774. This was not a part of the hospital general budget, but this hospital did have 19 (fellowships) registered nurses who were attending the university at hospital expense. This was true in another hospital also where 50 nurses took advantage of the opportunity to do some collegiate work.

Library facilities were reported in all institutions.

The survey indicated that student nurses in the basic professional programs are in the only group which pays any tuition and/or other fees. This income to the hospitals is negligible in off-setting the cost of the nursing education programs.

In only two hospitals were data available concerning the cost of malpractice, personal liability and workmen's compensation insurance, as it was pro-rated to education. One hospital paid \$3,436.59 and the other \$31,670 for this item.

The total contribution to education evolved from a compilation of data in twenty-one tables, which indicated that these eleven hospitals spent at least \$2,043,523.57 while educating and/or training the following students in formal programs:

|                                       |       |
|---------------------------------------|-------|
| Medical clerks                        | 146   |
| Medical interns                       | 67    |
| Medical residents                     | 254   |
| Medical fellows                       | 18    |
| Dental interns                        | 2     |
| Dental residents                      | 2     |
| Oral surgery residents                | 1     |
| Student chaplain                      | 1     |
| Clinical psychologist                 | 1     |
| Medical technologists                 | 27    |
| (clinical laboratory technicians)     |       |
| Operating room technicians            | 2     |
| X-ray technicians                     | 4     |
| Dietary trainees                      | 4     |
| Basic professional nurses             | 287   |
| 153 in a 4-year program               |       |
| 134 in two 3-year programs            |       |
| Affiliating basic professional nurses | 355   |
| 346 in pediatrics                     |       |
| 9 in obstetrics                       |       |
| Postgraduate registered nurses        | 84    |
| 34 on part-time clinical work         |       |
| 50 as full-time employees             |       |
| Practical nurses                      | 54    |
| Medical record librarian              | 1     |
|                                       | 1,308 |

254 pages. \$3.18. Mic 56-125

## SPECIAL PROVISIONS FOR THE GIFTED IN CALIFORNIA PUBLIC SECONDARY SCHOOLS

(Publication No. 15,355)

Vernon Eugene Trimble, Ed.D.  
Stanford University, 1955

### Purpose

The purpose of the study was to determine the provisions made for the education of gifted students in California public secondary schools. A descriptive study, its aim was to provide a statement of the attitudes of secondary school administrators toward the education of the gifted and a description of special programs which have been developed for this purpose.

### Definition of "Gifted"

For the purposes of this study, gifted was arbitrarily defined as "those students who have tested IQ's of 135 or higher or who have given other evidence of outstanding abilities."

### Survey instrument

Data for the survey were collected by means of a questionnaire designed to elicit information relative to the school's attitude toward, and special provisions for, the identification, education, and guidance of the gifted.

### Sampling

In May, 1954, questionnaires were sent to all public secondary schools listed under the classification "High School" in the California School Directory for the School Year 1953-54. Replies were received from 254 schools, 55.7 per cent of the number to which questionnaires were sent. Representation in terms of geographic distribution and size of school enrollment was fairly proportionate.

### Criteria

The findings of the survey were evaluated in terms of the following criteria, adapted from High-School Methods with Superior Students, published by the National Education Association (Research Bulletin, Vol. XIX, No. 4):

1. Especially enriched programs of class work
2. Rapid advancement
3. Elective subjects
4. Provisions for special abilities
5. Segregation
6. Extra-curricular activities

### Conclusions

The following conclusions were drawn from the findings of the study:

A great many principals of public secondary schools in the state, confronted with problems of greater magnitude in terms of number of students affected, do not regard the problem of the gifted of sufficient importance to justify a special program for the gifted. (Percentages of response: 42.9% consider the problem of sufficient importance to justify a special program; 57.1% do not.)

The majority of principals consider their college preparatory course, traditional extra-curricular program, and the regular counseling services of the school as sufficient provision for the gifted.

The majority of schools do not make special provision



for the gifted, other than what is achieved through enrichment of the regular curriculum.

The procedures followed by those schools having special programs are similar to the proposals made in High-School Methods with Superior Students.

The most frequently offered special courses, listed in order of frequency, are English, independent study, University of California correspondence courses, and mathematics.

The most frequently listed differences between these courses and the work of the regular curriculum are higher standards, more student planning, and greater use of individual projects.

Schools providing special courses for the gifted tend to be located in metropolitan, urban, or suburban areas; to be located in residential, as opposed to industrial or agricultural, areas; to enroll a high percentage of gifted among the school population; to have a high percentage of graduates continuing their education beyond high school graduation; and to identify the gifted in a more precise fashion, to provide more special counseling and guidance services for the gifted, and to make more provision for parent conferences than do the other schools.

The most frequently mentioned desired improvement in the programs for the gifted listed by administrators who indicated a concern for them is the introduction of special courses or the inclusion of additional special courses.

Financial limitation is the chief restriction on the development of more adequate programs for the gifted. A second restricting factor is the shortage of personnel adequately trained in the education of the gifted.

165 pages. \$2.06. Mic 56-126

#### THE READABILITY OF ECONOMIC TEXTBOOKS

(Publication No. 15,119)

Kenneth Clair Zahniser, Ed.D.  
University of Pittsburgh, 1955

The difficulty which secondary students are having with reading may be due to textbooks which are not adapted to their reading abilities.

The readability of economics textbooks can be determined by the use of evaluation tools which we have at our disposal. These tools are expressed in terms of a formula and take into consideration such factors as words, sentences, and syllables.

This study was conducted to ascertain the readability

of economics textbooks used in the teaching of economics in the secondary schools. It was desired to cite the ten most frequently occurring words in each section of the study and to list those economics words which appeared consistently and inconsistently in the three sections of the study.

The Yoakam and Flesch Readability Formulas were used to evaluate 30 economics textbooks published between January 1, 1930, and December 31, 1954. The study was divided into three sections. A Table was developed and used by the writer to convert the Flesch scores into grade placements for the comparison of results with the grades yielded by the Yoakam Technique.

The words obtained for the Yoakam Formula were also used to locate economics terms. Four criteria were used to isolate the words to be listed. The criteria included a dictionary of business and finance, a dictionary of economics, a list of essential technical business terms, and the indexes of the textbooks from which the words were derived.

The average grade placement by the Yoakam Formula was grade 10.75 as compared with 10.94 for the Flesch Formula. The grade placements of the 30 textbooks ranged from a low of grade 8.12 to a high of grade 13.30.

There were 5,656 different words obtained from 12,436 words sampled by the Yoakam Technique. They have an average Thorndike index difficulty of 7.75 per word. These words yielded 346 different economics terms with an average frequency of 10.2 for each word.

There were 183 of the 346 different economics words which were common in the three sections of the study. They represent 53 per cent of the different economics words and account for 84 per cent of the economics words. The average index difficulty is 8.33 per word.

There were 79 different words of an economics classification which were common to two of the sections of the study. They have an index difficulty of 11.1 per word.

There were 84 different economics words which were found in only one section of the study. They have an average index difficulty of 13.4 per word.

The average secondary economics textbook has a grade placement of about eleventh grade.

Economics textbooks should be evaluated for readability because the grade placements will vary two or more grades above and below the eleventh grade.

Most of the different economics words appear consistently in the textbooks and are slightly more difficult than the noneconomics words.

About one economics word out of every 16 economics words appears inconsistently in the textbooks and constitutes difficult economics terminology.

129 pages. \$1.61. Mic 56-127



## ENGINEERING

### ENGINEERING, GENERAL

#### FLUID DYNAMICS OF THE RANQUE-HILSCH TUBE

(Publication No. 15,163)

William Alfred Scheller, Ph.D.  
Northwestern University, 1955

A Ranque-Hilsch tube approximately one inch in diameter and 55 inches long was constructed from brass. Temperature and pressure traverses were made at three different positions along the hot tube at each of three different inlet air pressures (25, 50, and 75 psig) and three different fractions of air flowing out of the cold tube. From the pressure and temperature data, the Mach numbers and velocities of the air at points in the hot tube were calculated. The locus of points at which the air reversed its axial direction of flow was also determined.

From the experimental and calculated data, maps of lines of constant velocity, constant static and stagnation pressure, and constant static and stagnation temperature in the hot tube were plotted.

Extrapolation of the experimental temperature and pressure data to the point where the air just enters the tube from the nozzle shows that the air undergoes an isentropic expansion and cooling in the nozzle. The highest pressure and lowest static temperature in the tube are found at this point.

The equation for a streamline in the hot tube was developed from the Navier-Stokes equation. In differential form the streamline equation is:

$$dP - d\tau + \rho v dv = 0$$

where:

$P$  = static (true) pressure of the air  
 $\tau$  = viscous shearing stress in the air  
 $\rho$  = density of the air  
 $v$  = velocity of the air

In the integrated form the equation is:

$$P - \tau + \int \rho v dv = \text{constant along a streamline.}$$

In certain regions of the hot tube, the viscous shearing stress was negligible, and streamlines were shown to be approximated by lines of constant stagnation (total) pressure.

The temperature maps show that the stagnation temperature of the air at the axis of the hot tube is lower than the stagnation temperature of the air near the wall. The static temperature of the air at the axis is higher than the static temperature near the wall.

An equation for the Stanton number  $\left(\frac{h}{\rho v c_p}\right)$  at any point on a streamline in the hot tube was developed. This equation is:

$$St = \frac{\pi \text{ grad } T_0}{4 \text{ grad } T}$$

where:

$$St = \text{Stanton number} = \frac{h}{\rho v c_p}$$

$h$  = convection heat transfer coefficient

$c_p$  = heat capacity at constant pressure

$\text{grad } T_0$  = stagnation temperature along the streamline

$\text{grad } T$  = static temperature gradient along a line perpendicular to the streamline

Stanton numbers were calculated at four points in the tube assuming that the streamlines were cylindrical helices at these points. From these Stanton numbers  $h$  was calculated. The value of  $h$  ranged from 1,300 to 10,400 Btu/hr, ft<sup>2</sup>, °F. The magnitude of these coefficients implies that heat is transferred in the tube by convection rather than by conduction.

Thus, the Ranque-Hilsch tube separates a stream of high pressure, room temperature air into two streams of lower pressure air, one at high temperature and the other at a low temperature by establishing a flow pattern inside of the hot tube, which permits heat transfer from the region of the axis to the region of the wall. The axial air, which is flowing out one end of the tube, is cooled. The air near the wall is heated as it flows toward the other end.

105 pages. \$1.31. Mic 56-128

### ENGINEERING, CHEMICAL

#### RADIAL HEAT TRANSFER IN FIXED BEDS

(Publication No. 14,412)

Shou Soon Kwong, Ph.D.  
Purdue University, 1955

Major Professor: J. M. Smith

In the general design procedure for fixed-bed catalytic reactors heat transfer in the radial direction is of fundamental importance. This information is needed for controlling the temperature of the bed within the desired optimum range. In this work factors influencing radial heat transfer in packed beds were under study.

Preheated gas was passed upward through a vertical cylindrical pipe packed with spherical particles. The pipe was provided with a jacket containing boiling water to keep the wall of the pipe at a constant temperature of 100°C. When the steady state was established, the temperature distribution across the diameter of the packed bed at the desired level was recorded by nine thermocouples inserted into the packed bed from the top of the pipe. The results were expressed in terms of effective thermal conductivity of the gas-solid system.

The scope of the investigation covers four particle sizes from 5/32" to 0.36", five mass velocities from 150



to 1200 lbs./hr., sq. ft., two gases (air and anhydrous ammonia), two kinds of packing materials (steel and alumina), and two pipe sizes.

The basic differential equation for temperature in a cylindrical bed in the absence of reaction is

$$\frac{\partial T}{\partial z} = \frac{k_e}{c_p G} \left( \frac{1}{r} \frac{\partial T}{\partial r} + \frac{\partial^2 T}{\partial r^2} \right) + \frac{1}{c_p G} \frac{dk_e}{dr} \frac{\partial T}{\partial r}$$

where  $T = t - t_{\text{wall}}$ ;  $k_e$  is the effective thermal conductivity;  $z$  is the coordinate along the axial direction; and  $r$  is the coordinate along the radial direction. Since both the mass velocity,  $G$ , and the effective thermal conductivity were found to vary in a complex manner with radial position, it is difficult, if not impossible, to solve this differential equation by analytical methods. Previously, a graphical method was developed by Stallings (45). In this approach graphical differentiation was used to determine the derivatives. The results were substituted back into the equation. With proper boundary conditions  $k_e$  at various radial position can be calculated. One of the disadvantages of this method is that it requires temperature data at several bed heights. In the present work two numerical methods, each requiring the radial temperature distribution at only two bed heights, were developed. Thus the information needed for these methods is one half or less of that needed for the graphical method. For the actual calculations in the numerical methods an IBM card-programmed calculator of moderate speed was used.

The experimental values of  $k_e$  obtained in this work were compared with the theoretical values calculated by the method of addition of contributions proposed by Argo (1). The agreement between the experimental and predicted values was not satisfactory except in the region close to the wall of the pipe. The experimental  $k_e$ 's were higher than the predicted values. Furthermore, the experimental results showed a marked radial variation while the predicted values varied little with respect to the radial position in the central core. This was especially true at low mass velocities. The possible sources of discrepancies were discussed. It appeared that the limitations involved in the evaluation of the contribution to  $k_e$  by turbulent diffusion of the fluid and that due to the so-called series mechanism were responsible for the major part of the discrepancy. However, further experimental work is desirable in such areas as the effect of temperature on the radial distribution of mass velocity and the radial mass transfer rates, and the radial variation of heat transfer coefficient between the surface of the solid particle and the fluid.

161 pages. \$2.01. Mic 56-129

# EQUILIBRIUM WATER CONTENTS OF NATURAL GAS DEHYDRATED BY AQUEOUS DIETHYLENE AND TRIETHYLENE GLYCOL SOLUTIONS AT VARIOUS TEMPERATURES AND PRESSURES

(Publication No. 15,459)

Francis Mark Townsend, Ph.D.  
The University of Oklahoma, 1955

Natural gas as produced always contains some moisture. Presence of moisture may cause formation of gas hydrates which plug transmission lines, decrease in line capacity due to accumulation of condensed water, and internal corrosion of the pipe line. The removal of sufficient moisture to prevent water condensation is the best solution to the problem.

Many investigations have been conducted to determine the effectiveness of various agents for dehydrating natural gas. This investigation has been undertaken to determine the effectiveness of concentrated aqueous diethylene and triethylene glycol solutions in dehydrating water-saturated natural gas at atmospheric temperatures, and relatively high pressures. The method consisted of saturating natural gas with water at temperatures of 70, 80 and 90 F., at pressures varying from 500 to 2500 pounds per square inch absolute, and introducing this saturated gas into an equilibrium cell containing a substantial excess of concentrated diethylene glycol. The two phase mixture was agitated until equilibrium was reached. The water content of the dehydrated gas was determined by use of a thermistor bridge circuit which indicated the moisture content from the measured rise in temperature resulting from the reaction of the moisture in the gas with a mass of calcium hydride particles. Moisture content is directly proportional to temperature rise. The procedure was repeated for triethylene glycol. "Spot checks" were also obtained on hexylene glycol and a glycol mixture, "Dicol".

Smoothed data are presented on the equilibrium water vapor contents of natural gas dehydrated by diethylene and triethylene glycols of 95, 98 and essentially 100 per cent by weight concentration at 80 F., and at pressures ranging from 500 to 2500 pounds per square inch. Cross plots have been prepared to permit the estimation of equilibrium water contents of natural gas dehydrated by aqueous glycol solutions of intermediate concentrations.

It was found that the water vapor content of gas dehydrated with diethylene and triethylene glycols decreases with increasing glycol concentration and increasing pressure within the limits of the investigation. It was also found that variation in system temperature from 70 to 90 F. has a negligible effect on water vapor content of the dehydrated gases throughout the ranges of glycol concentration and pressure investigated.

The data presented are recommended for the design of facilities for the dehydration of natural gases of similar composition by aqueous diethylene and triethylene glycol solutions over the temperature, pressure and concentration ranges of this investigation.

126 pages. \$1.58. Mic 56-130



## ENGINEERING, CIVIL

INELASTIC BEHAVIOR OF MILD  
STEEL BEAMS SUBJECTED TO  
TRANSVERSE IMPACT

(Publication No. 15,224)

Frank Leslie Howland, Ph.D.  
University of Illinois, 1955

The response and resistance of a dynamically loaded mild steel beam has been approximated by consideration of a single-degree-of-freedom model that is simpler for dynamic analysis. The resistance of the beam and model has been considered to consist of the following phases: (1) an initial elastic resistance; (2) a subsequent inelastic resistance which may be a function of the displacement, velocity, and time; and (3) finally, a recovery resistance that is essentially elastic. The elastic phases of the resistance are functions of the displacement only and have not been considered in this investigation.

The initial phase of the inelastic resistance of the model was found to be a function of the velocity, the time, and the static elastoplastic resistance. This time-dependent resistance has been assumed to be given by the following expression:

$$\dot{w} = (1/K)\dot{R} + \alpha[R - R_{fp}]$$

where  $\dot{w}$  and  $\dot{R}$  are the rate of change of the displacement and resistance, respectively, with respect to time;  $K$  is the elastic spring constant;  $R$  is the resistance; and  $R_{fp}$  is the static "fully-plastic" resistance. The time-dependent resisting function is applicable until the time that it is equal to or less than the static resistance, which includes the effect of strain-hardening of the material.

From the information in the literature, and from a consideration of the static inelastic deformation process, it was found that the parameter  $\alpha$  could be expressed as follows:

$$\alpha KT = (\beta T/C)^n (u')^{1-n}$$

where  $u'$  is a dimensionless velocity,  $T$  is the period of the beam, and  $\beta$ ,  $C$ , and  $n$  are constants. The constant  $\beta$ , which is determined by the load distribution along the beam, relates the velocity  $u'$  to the maximum strain-rate. Because of the derived form of  $\beta$  the time-dependent resisting function is restricted to statically determinate beams. The constant  $C$  is essentially a dynamic shape factor. Both  $C$  and  $n$  are determined, in part, by the relationship between the lower yield stress of the material and the strain-rate.

The applicability of the procedure was investigated by predicting the response of several beams and frames for known loads and comparing the predicted response with the response measured in tests. This comparison has indicated that the magnitude of the derived constants are essentially correct but that further adjustment of the constant  $\beta$  is necessary.

From a brief study of the time-dependent resistance, an approximate method has been outlined for estimating a dynamic "fully-plastic" resistance to replace the more complex time-dependent resistance.

Two additional investigations are included as Appendices: (1) A criterion for estimating the dynamic elastic limit resistance and displacement of the structure. This criterion is based on the available information concerning

the delay time for yielding. (2) A semigraphical procedure for including the effect of strain-hardening of the material on the static resistance and response of inelastically deformed structures. 175 pages. \$2.19. Mic 56-131

ANALYTICAL STUDY OF THE  
RELATIONS AMONG VARIOUS  
DESIGN CRITERIA FOR  
RECTANGULAR PRESTRESSED  
CONCRETE BEAMS

(Publication No. 15,231)

Fazlur Rahman Khan, Ph.D.  
University of Illinois, 1955

## INTRODUCTION

The nature of current design procedures for prestressed concrete beams has suggested that there is a need to establish interrelations among the various design criteria. These relations have been developed and expressed analytically and graphically for a beam of rectangular cross-section, with special attention to the relations between allowable stresses and factors of safety against cracking and against failure.

The following variables were considered: (a) allowable tensile and compressive stresses in the concrete at initial prestressing and at working loads; (b) allowable tensile stress in steel at initial prestressing, and effective tensile stress at working loads; (c) the ratio of live-load to dead-load moment; and (d) the eccentricity of the prestressing steel.

## OPTIMUM DESIGN EXPRESSIONS

It is shown that minimum areas of both concrete and steel are obtained if a maximum number of the allowable stresses in concrete are satisfied simultaneously. In general, three of the four allowable stresses in concrete can be satisfied simultaneously while the fourth remains on the safe side and, on this basis, four "optimum design criteria" were developed.

Design expressions were derived for each criterion in terms of dimensionless quantities involving the dead and live-load moments, the concrete and steel stresses at different stages of loading, and the gross percentage of steel.

## FACTORS OF SAFETY

For each optimum design criterion, expressions were derived for total and live load factors of safety against cracking. These expressions were based on the assumption that the stress-strain relationship in concrete remains linear up to first cracking. Generalized expressions were also derived for total and live load factors of safety against failure in flexure for each optimum design criterion.

Finally, a critical study of five current specifications for prestressed concrete was made in the light of the findings obtained in the thesis.

## CONCLUSIONS

The following conclusions were derived from the analytical study:



(a) In the design of prestressed concrete beams, definite interrelations exist among the different variables and the factors of safety against cracking and ultimate.

(b) The design expressions and the factors of safety are very sensitive to the total loss of prestress due to creep and shrinkage of concrete and relaxation of steel.

(c) Specifications for the design of prestressed concrete structures may be simplified by eliminating redundant or incompatible requirements. There are indications that a properly drawn specification based only on working loads and stresses can automatically satisfy desirable requirements concerning behavior of a beam at cracking and at failure. 174 pages. \$2.18. Mic 56-132

#### HYDROLOGICAL CHARACTERISTICS OF LAKE MENDOTA DRAINAGE BASIN

(Publication No. 14,771)

Ambrose Everett McCaskey, Jr., Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Arno T. Lenz

The Lake Mendota Drainage Basin is located in the south central portion of the State of Wisconsin, and is wholly contained in Dane and Columbia Counties. The basin is adequately covered with twelve weighing-type recording rain gages. Flow from four of the major tributary basins, comprising 63% of the Mendota Basin area, is measured at control weirs with automatic water-stage recorders. The four tributary basins are from 6.1 to 70.0 square miles in area. A stage gaging station at Tenney Park Locks in Madison in the Yahara River Outlet from Lake Mendota permits the measurement of the total surface runoff. Further, this station provides data for making a water balance of the Lake Mendota Drainage Basin.

The distribution of annual rainfall in the area is such that the greater percentage occurs during the growing season when agricultural activity is greatest. The watershed is extensively cultivated and is noted for its productivity in forage crops, oats and corn.

Storms of high intensity which occurred during the Water Years 1953 and 1954 are studied in detail. Due to the extremely high retention rates the Thiessen average rainfall required to produce runoff was one inch. Variations in the rainfall on the basins are sufficient to influence the runoff. Storm intensity studies are presented with some discussion of the runoff produced.

Preliminary studies on the influence of soil moisture as measured by antecedent rainfall are sufficient to show that such an index can be valuable in rainfall-runoff studies.

A water balance of the entire drainage basin indicated that the subterranean flow into Lake Mendota was approximately 40 cubic feet per second for a normal year.

Flood flow hydrographs are presented for each of the storms studied, and in addition the occasional flood flow to be expected not usually more than once a year is given by the following expression:

$$q = \frac{23}{4\sqrt{\text{Area}}}$$

where  $q$  is in cubic feet per second per square miles and Area is the area of the drainage basin in square miles.

Basic values of the major factors concerning rainfall runoff relationships and suggested problems for further study are presented. 183 pages. \$2.29. Mic 56-133

#### A STUDY OF THE INTERACTION BETWEEN SLABS AND FLOOR BEAMS IN BUILDINGS

(Publication No. 15,421)

Fouad Abdel-Rahman Osman, Ph.D.  
Cornell University, 1955

Chairman: Professor George Winter

This study attempts to determine the possible reduction in the live load moments in the beams due to the capacity of the slabs to carry part of the live load in bending. In order to do this, the investigation is divided into two parts, the first dealing solely with the action of the slab when considered in connection with the supporting beams alone and the second when the slab is considered as a part of an entire structural frame.

In all the investigations, the basic flexural theory of plates is used which involves the customary assumptions for the flexure of medium-thick plates.

Two cases are investigated for the interaction of the slabs and supporting beams. One deals with a uniformly loaded rectangular slab with simply supported edges and also supported elastically at the center line by an intermediate beam. The other treats a similar uniformly loaded rectangular slab with two intermediate beams placed symmetrically about the center line at the third points of the slab.

The study of the simply supported slabs is carried out for slab widths of 15, 20 and 25 ft. and for length to width ratios  $c = \frac{L}{b}$  of 1, 1.5 and 2.

The problem is analyzed by means of the principle of least work.

Frame action investigation is carried out for a two-panelled five story building and a similar three-panelled five story building. For the two-panelled frame building, the study is made for three different buildings of two equal panels each. The study is limited to different spacings of columns across the building, while the corresponding story heights of the three buildings and the ratio of column spacing across the building to that along the building are kept constant. The study is confined to the first and fifth floors only.

A similar investigation is carried out for the three-panelled frame buildings. As in the previous case, the same limitations apply as to the height of the building, height of story, spacing of columns across and along the building with the exception of having an interior hallway.

The problem is analyzed by the application of difference equations.

The results of the first part indicate that the interaction between the slab and floor beams has the effect of reducing the conventional design live load moment and the total design moment in the beam. However, this effect decreases



with the increasing values of  $c$  and with increasing relative beam rigidity. The reduction is only significant for certain combinations of  $c$  and of relative beam rigidity. For design purposes the reduction in the live load moment for the cases investigated is given by means of a convenient approximate curve-fitting formula. This approximate formula is in the following form:

$$p = \frac{100}{1 + Q\lambda}$$

where

$p$  = per cent reduction in the design live load moment

$Q = K\ell$ , a constant which depends on the boundary conditions, on  $c = \frac{L}{\ell}$ , and on the number of interior beams and is proportional to the length of the beam.

$\ell$  = length of the beam.

and

$\lambda$  = beam-slab relative rigidity.

$K$  values for the various cases investigated are given in the thesis.

The results of the second part indicate that:

1. The effect of the interaction between the slabs and floor beams in reducing the conventional design live load moment and consequently the total design moment is only significant for the floor beams lying between the column lines.
2. In each building, the per cent reduction in bending moment in these latter beams in both the floors that were investigated differed only very slightly.
3. The per cent reduction in these supporting beams differed only very slightly for a two and for a three panelled frame building having the same dimensions (except for the added hallway in the three-panelled frame building).
4. The effect of the interaction between slabs and floor beams depend only on the relative beam rigidities.

For design purposes, the reduction in the live load moment is given by means of an approximate curve-fitting formula. This approximate formula is similar in form to that of the first part:

$$p = \frac{100}{1 + Q\lambda}$$

where

$p$  = per cent reduction in the design live load moment.

$Q$  = a constant depending on the ratio of column spacing across the building to that along the building and the number of floor beams lying between the column lines.

and

$\lambda$  = beam-slab relative rigidity.

The value of  $Q$  for all the cases investigated was found to be equal to 0.25. 168 pages. \$2.10. Mic 56-134

## ENGINEERING, ELECTRICAL

### FACTORS AFFECTING THE MICROWAVE SPECTRA OF SPARK GAP IMPULSE GENERATORS

(Publication No. 14,402)

Eugene Beutler Hunt, Ph.D.  
Purdue University, 1955

Major Professor: Roscoe H. George

The development of an impulse generator for producing high peak power output over a continuous frequency spectrum from one to three thousand megacycles, in which a spark is used as a very fast acting switch to produce substantially a step voltage, has led to an investigation of electrode metals and gases used under conditions not heretofore reported on in the literature. This study appears to be unique in that it is made by sampling the microwave frequency spectrum of the output.

The research reported on in this thesis consisted of a study of the factors affecting the output of a coaxial line impulse generator using a short spark gap operating in various gases at pressures up to nine hundred pounds per square inch and at pulse rates up to fifty thousand pulses per second or more. Since very little was known about the fast rise of current in a spark discharge under these conditions, a great amount of the work was experimental in nature and consisted of making a study of various metals suitable for spark electrodes and of various gases for pressurizing the spark gap.

The power output from the generator is expressed in terms of the peak power per pulse on the basis of a lossless system containing a single-tuned circuit having an equivalent noise bandwidth of one megacycle. The available thermal noise power obtainable from an electrical circuit at room temperature per megacycle of bandwidth is used as a standard for comparison purposes, and the peak power per pulse per megacycle of equivalent noise bandwidth is expressed in decibels above this standard. The peak power per pulse is calculated from quantities readily measured by means of fixed-frequency coaxial line filters used in conjunction with low pass filters and microwave power measuring equipment.

The results from this investigation show that the impulse generator produced the greatest output with gold or platinum electrodes and hydrogen gas, but that tungsten electrodes were the most satisfactory for practical operation. Peak power values of 139 to 145 decibels above thermal noise were obtained at frequencies in the range of one thousand to thirty-one hundred megacycles. The generator output was down ten, sixteen, and twenty decibels when operated with oxygen, carbon dioxide, and argon respectively.

A major portion of the results consists of performance studies of the impulse generator operating with tungsten electrodes in hydrogen gas. Experimental data are presented which show the variation in peak power output for changes in gas pressure, gap spacing, pulse repetition rate and sampling frequency. It is shown that the increase of peak power output with increase of pressure is proportional to the square of the charging voltage, while this relationship does not hold for variation of gap spacing.



Studies made of the voltage frequency spectra of the impulse generator show that although the rise time of the pulse is probably increased by an increase of gap length, it cannot be the only factor which is significant in changing the voltage frequency spectrum with variation of gap length. It is also concluded that the breakdown mechanism of the gas in the gap is probably very similar to that proposed in the streamer theory. 144 pages. \$1.80. Mic 56-135

**SYNTHESIS AND ANALYSIS OF  
FEEDBACK CONTROL SYSTEMS  
BASED ON PEAK-POWER  
REQUIREMENT**

(Publication No. 14,425)

Theodore Anthony Savo, Ph.D.  
Purdue University, 1955

Major Professor: J. R. Burnett

This thesis presents a procedure for the synthesis and analysis of feedback control systems based on peak-power requirement. The procedure is based primarily on the correlation found between the power step-function response and locations of the poles and zeros of  $C/R(s)$ .

The peak-power criteria established are the results of a thorough study of the power requirement of control systems in both the time and frequency domain. The characteristics of power in the frequency domain are conveniently summarized in a table of power transforms for the common pole-zero configurations of  $C/R(s)$  encountered in control systems. The peak-power response is obtained essentially from the power transform and the variational effects of various pole-zero locations, of  $C/R(s)$ , on the peak-power are presented in graphical plots suitable for synthesis and analysis. For example, the effects of varying  $\zeta$ ,  $\omega_n$ , the position of a real zero, the position of a real pole, and the effects of dipoles, on the power step-function response are well established and serve as a guide in the design procedure. Examples illustrating the procedure are also presented.

It is felt that the above procedure, when properly followed, definitely reveals when a system can be expected to operate nonlinearly, at least from motor saturation effects. Most important, the procedure developed combines quite logically with the Guillemin-Truxal procedure and yields an over-all approach for the linear synthesis and analysis of feedback control systems which handles a large variety of cases. 176 pages. \$2.20. Mic 56-136

**ON THE STATISTICAL DESIGN OF  
DEMODULATION SYSTEMS FOR  
SIGNALS IN ADDITIVE NOISE**

(Publication No. 15,388)

John Bowman Thomas, Ph.D.  
Stanford University, 1955

The problem investigated is the statistical design of demodulation systems to recover message signals corrupted by additive noise. The ideal demodulation system is one which, for a given input message and noise waveform, presents all possible message waveforms and the probability of occurrence of each. Practically, it is usually desirable to present only a single message. Selection of the message with the highest posterior probability corresponds to use of the method of maximum likelihood estimation. Systems designed on such a basis are discussed in this report and are called optimum systems.

It is assumed that the amplitudes of both message and noise have gaussian probability distributions. The optimum system is obtained by maximizing the posterior probability density function of the message and is specified by two integral equations. These equations contain as known functions the autocorrelation functions of message and of noise and the functional form of the modulated wave. Solutions of these equations result in receivers which are optimum on a maximum likelihood basis. For the assumed gaussian statistics, this is equivalent to optimum on a minimum mean-square-error basis.

As an example, it is shown that the solution of the integral equations for the simple filtering case yields the Wiener minimum mean-square-error filter as the optimum filter. Several properties of the optimum filter are discussed for later use and some examples of specific filter designs are given.

In the amplitude-modulated case (including pulse-amplitude-modulation), the optimum receiver is shown to be a cross-correlation detector followed by a form of Wiener filter. The mean-square-error for this receiver is calculated and compared to that of the square-law receiver. The optimum receiver always has a lower error except in limiting cases. However, it is quite easy to design AM receivers containing optimum filters such that the mean-square-errors approach that of the optimum receiver for high noise levels. Yet these receivers are unsuitable for reception at high noise levels. The fault lies in the inappropriateness of the mean-square-error criterion at high noise levels. For some purposes a more appropriate criterion is a measure of the loss of correlation between the message part of the input and the output of the various AM receivers. Such a measure is particularly valuable at high noise levels where the mean-square-error criterion is inappropriate and where correlation methods might be used to identify the message after reception. When such methods are used the type of receiver affects the degree of uncertainty in determining the true message. A measure of this uncertainty is the fluctuation of the received indication about its true value. This fluctuation is calculated for the cross-correlation and the square-law receivers.

Specification of the optimum AM receiver requires a knowledge of message and noise power spectra and of carrier amplitude and phase. The error introduced when the carrier phase and magnitude are unknown is given and it is shown that the optimum receiver is relatively insensitive to such errors.



For angle-modulated waves (such as PM and FM) it is difficult to solve for the optimum receiver except approximately. Within the limits of the approximations made, the optimum PM receiver is a locked-oscillator type of detector. For low index of modulation the optimum PM receiver is essentially the same as the optimum AM receiver except that the cross-correlating voltage has been shifted  $90^\circ$  in phase.

149 pages. \$1.86. Mic 56-137

**A STUDY OF THE FOURIER-ANALYSIS  
METHOD OF OBTAINING THE  
ELECTROMAGNETIC FIELD FROM A  
GIVEN CURRENT DISTRIBUTION**

(Publication No. 14,434)

Chitti Wacharasindhu, Ph.D.  
Purdue University, 1955

Major Professor: W. H. Hayt, Jr.

The method of obtaining the electromagnetic field from a given current distribution by the use of the Fourier series, as used by Moullin, and by the use of the Fourier integral, as used by Hayt, are extended in this dissertation.

General procedures are developed for solving problems involving current distributions (in two dimensions) which are either periodic, non-periodic, or a combination of both, by the use of the Fourier integral table. One integral of the table is used to decompose the given current into current elements of known fields. Another integral is used to superpose these known fields in order that the required field of the given current is obtained.

These general procedures are made possible by the use of the complex form of the Fourier analysis and by the introduction of differentiating from each other each space quadrature factor and the time quadrature factor.

The known fields of fundamental problems of current filament are verified in order to show the simplicity and effectiveness of this method. A number of selected unsolved problems are solved as examples of the application of the procedure developed above.

An example of the application of this method together with that of the direct summation of fields to problems concerning current distribution in three dimensions is also given.

These general procedures have proven to be simple, effective and compact for the sample problems. They are applicable to any other problems with any other current distributions. However, as the complexity of the current distribution increases so will the complexity of the integrals or the infinite series summations.

157 pages. \$1.96. Mic 56-138

**AN APPROACH TO THE SYNTHESIS  
OF NONLINEAR SERVOMECHANISMS**

(Publication No. 14,436)

Robert Kirk Whitford, Ph.D.  
Purdue University, 1955

Major Professor: J. R. Burnett

The problem of concern is the development of an approach to the synthesis of optimum nonlinear feedback control systems. It is assumed that sufficient statistical information is available so that the optimum nonlinear closed-loop characteristics are determinable by the theory of Singleton.<sup>1</sup> These characteristics then assume the form of a multi-dimensional power series of present and past samples of the input where the optimization is in the mean-square sense. Thus the input must consist of pulses quantized both in time and amplitude. Certainly the same methods are applicable for continuous signals of limited frequency bandwidth, where the signal can be approximately represented by periodic samples and quantized levels. The approach is based on the philosophy that the feedback system be required to yield the desired results as determined by the known overall characteristics.

the preceding assumptions allow the formulation of the mathematical expression for the open-loop function having the desired closed-loop response. The system, for the purpose of analysis, is considered to have essentially zero response time. Such a constraint is of little consequence for systems simulated on an analog computer. Digital computer simulation, however, requires a comparatively long time of response and the problem is nominally solved by making the input pulse of sufficient width to allow steady-state conditions to occur before the next pulse.

The process of determining the open-loop function is that of finding the effect of the past samples of the error on the present error sample. Once these effects are found, the open-loop function to be synthesized is initially assumed so that no cross-terms of the error samples are present. Thus the network operating on the first past error is designed independently of that operating on the present error. Since the previous error sample depended on one more past value of the input than is now known, there is some ambiguity about its exact value when the present error is known. Hence, the network operating on the past error is designed to give constant output for each ambiguous situation. Networks operating on error samples further removed from the present are designed in a completely analogous manner.

The resulting mathematical expression is best realized by either an analog or a high-speed digital computer. The specific geometry of the open-loop function is chosen because it seems most likely to lead to the realization of the open-loop system as the tandem connection of a simple nonlinearity (one with no memory) and a linear network.

The stability criterion is established on the basis that the iteration process caused by the feedback must converge. Absolute stability is made possible by compensation with linear gain amplifiers. The amplifiers are placed so that the open-loop function necessarily satisfies the convergence criterion for iteration processes.

This approach at present is just another tool placed at the designer's disposal for determining functionally the open-loop system for a given nonlinear closed-loop



characteristic. However, the author feels that an extension of this approach or a combination with existing nonlinear approaches might well lead to a logical synthesis procedure for nonlinear servomechanisms.

96 pages. \$1.20. Mic 56-139

I. H. E. Singleton, *Theory of Nonlinear Transducers*, Technical Report No. 160, Research Laboratory of Electronics, M.I.T., August 12, 1950.

## ENGINEERING, MARINE

### CIRCULATION AND WATER TRANSPORT IN THE COASTAL AREA BETWEEN MARTHA'S VINEYARD AND BARNEGAT INLET, NEW JERSEY

(Publication No. 15,423)

Charles Fales Powers, Ph.D.  
Cornell University, 1955

Although the general circulation pattern over the continental shelf of the eastern United States is, in its broader aspects, fairly well understood, some parts of the coastal circulation have not been worked out. The present work was designed to study, in some detail, the summer conditions of circulation and water transport in the coastal area between Martha's Vineyard, Massachusetts, and Barnegat Inlet, New Jersey, including Block Island Sound.

In the summer of 1951, 228 hydrographic stations were occupied in the study area. Observations were made of salinity, temperature, transparency, water color, dissolved oxygen, and meteorological conditions. These data were analyzed in the laboratory ashore and made possible the establishment of a plan of circulation for the area, as well as calculations of water transport within the New York Bight. Circulation was deduced from distributions of all available parameters and from dynamic computations. Information on water types and their formation was derived from an analysis of T-S diagrams and "mixing triangles". Water transport was computed by two independent methods, the non-tidal drift and a modified dynamic topography suitable for use in shallow water.

The results indicated that three separate water masses existed within the area. Formation of these masses involved mixing of offshore water with the effluents of Long Island Sound and New York Harbor. The surface and mid-depth circulations, inshore from the 25-fathom depth contour, were characterized by a rather complicated southwest coastal flow containing a large number of eddies. A landward countercurrent to the New York Harbor estuary existed on the bottom of the Hudson Canyon. An upwelling occurred along the New Jersey coast between Sandy Hook and Manasquan Inlet. Seaward of the 25-fathom contour a southwest drift was also evident, extending to the region of Cape Hatteras. Calculations of non-tidal drift and dynamic topography were for the most part in excellent agreement. They indicated that non-tidal currents within New York Bight were of small magnitude. Average cross-sectional

velocities as great as 0.5 feet per second were rarely encountered. Average rates of flow in the mixed layer containing the freshwater runoff ranged between 0.11 and 0.24 feet per second.

It is believed that the circulation pattern deduced for the summer of 1951 closely represents the fundamental summer circulation for this area. Conditions of wind and precipitation appeared to be normal and no violent storms occurred which could have modified the typical pattern.

197 pages. \$2.46. Mic 56-140

## ENGINEERING, MECHANICAL

### AN INVESTIGATION OF AEROSOL COAGULATION BY MEANS OF AIR-JET GENERATED ULTRASONIC VIBRATIONS

(Publication No. 15,402)

Robert Marshall Fryar, Ph.D.  
Purdue University, 1950

Major Professor: Dr. R. C. Binder

The present day methods of air cleaning are described and compared, and it is concluded the combination of the ultrasonic coagulator and the cyclone precipitator has advantages not found in any other method or combination of methods of air cleaning equipment.

A study is made of the air-jet ultrasonic generator and it is found that when the generator is operated at optimum conditions, which are determined, it has certain advantages over the siren-type generator in that it produces waves of comparable intensities with higher efficiency, lower weight per unit of power output, greater simplicity of design, and smaller cost of manufacture.

A study of the reflection characteristics of the ultrasonic beam reveals that at frequencies as low as 12.5 kc/sec, the beam is reflected from solid objects in the same manner as light and with negligible loss. This allows the air-jet generator's spherical output to be converted into more applicable plane waves for use in the coagulation process.

A particle size study reviews the methods available to measure the particle sizes of smokes and dusts, lists the particle sizes of common industrial dusts, and makes a study of the frequency ranges for various particle size ranges. In addition, an analysis of the growth of particle sizes as a result of the action of ultrasonic waves is made; and it is demonstrated that small size smoke particles may be sufficiently increased in size so as to be efficiently removed by the cyclone precipitator.

183 pages. \$2.29. Mic 56-141



# **THERMAL CONDUCTIVITY DETERMINATIONS FOR SUSPENSIONS OF GRAPHITE IN WATER AND OIL**

(Publication No. 13,935)

Thomas Bradley Jefferson, Ph.D.  
Purdue University, 1955

Major Professor: W. L. Sibbitt  
Co-chairman: O. W. Witzell

Over the past fifty years or more, researchers have been interested in thermal conductivities of two-phase dispersions. Many such conductivity values have been measured, and a number of equations for predicting these values have been proposed.

In this paper, an explicit analytical equation for the apparent thermal conductivity of a two-phase mixture, expressed as a function of the component conductivities, is developed. This relation is applied to suspensions consisting of various concentrations of graphite in oil and in gelled water. Measured conductivities of these same mixtures are presented for comparison, along with theoretical values which were calculated by means of several equations published in the literature.

It is expected that the new relation presented here will apply to any two-phase system which satisfies the assumptions made in the derivation, the most important of which are:

1. one-dimensional heat conduction only (no convection or radiation),
2. uniform, spherical particles of the dispersed phase.

78 pages. \$1.00. Mic 56-142

# **HYDRODYNAMIC PERFORMANCE OF VERY SHORT JOURNAL BEARINGS UNDER CONDITIONS APPROACHING ZERO MINIMUM OIL FILM THICKNESS**

(Publication No. 15,022)

Leonardt Ferdinand Kreisle, Ph.D.  
Cornell University, 1955

This thesis is a presentation of experimental data concerning the hydrodynamic performance of short journal bearings under conditions approaching zero minimum oil film thicknesses near or in the region of boundary or marginal lubrication. A short journal bearing is defined as a cylindrical bearing in which the length to diameter ratio is less than one. Experimental data is presented for short bearings with lengths as small as 1/53 of the diameters. Very short journal bearings, approaching sheet metal thicknesses in length, are of interest in the design of computing and other machinery where lubrication is likely to be intermittent or imperfect. Theoretical performance of short journal bearings by several theories are compared with the experimental findings of extremely short bearings. This work is the first step to determine to what extent hydrodynamic lubrication conditions apply in very short journal bearings.

The basic variables of short journal bearing lubrication are found to be the operating dimensions of the bearing and

journal, clearance, minimum oil film thickness, eccentricity of journal relative to center of bearing, the attitude angle between the line of loading on the bearing and the position of minimum oil film thickness, rotational speed of the journal, oil viscosity, radial load on the bearing, and inlet oil pressure. Employing the above variables, the following load numbers are defined: clearance load number, experimental clearance load number, minimum oil film thickness load number, experimental minimum oil film thickness load number, and oil pressure load number. Theoretically and experimentally determined load numbers are compared and are found to be in reasonable agreement. These load numbers are found to be useful in predicting and analyzing the performance of short journal bearings.

Coordinates of the displacement of the journal relative to the bearing are measured by means of Microformers and suitable demodulators. All data are translated into DC signals and recorded by the use of a nul-balance recording potentiometer.

Experimental bearing friction torque and oil flow rate are compared with theoretical predictions by use of the clearance load number and the oil pressure load number. A means of computing journal friction torque is given. The journal friction torque always exceeds the bearing friction torque, possibly up to several hundred per cent for very high clearance load numbers.

The effect of employing radial oil holes or axial circumferential pressurization to introduce oil into a bearing and the effect of the sharpness of the edges of the ends of a bearing upon oil flow rate are discussed with experimental data presented.

The Ocvirk short bearing theory and the Cameron and Wood solution are found to give good predictions of actual bearing performance.

The effect upon the hydrodynamic oil film of introducing air into the lubricating oil of the bearing, the suddenness of a load application resulting in a heavily loaded journal, and the starting of a heavily loaded journal from rest to some finite rotational speed are discussed in the light of experimental observations. Run-in of new bearings is mentioned.

So long as the minimum oil film thickness is of the order of or exceeds the root mean square surface roughness of the journal and bearing, experimental bearing friction torque data indicate the presence of hydrodynamic film lubrication. When the minimum oil film thickness is less than the root mean square surface roughness of the journal and bearing, experimental data indicate the presence of marginal or boundary lubrication. Short journal bearings are found to operate successfully under conditions of marginal or boundary lubrication but with bearing and journal friction torques exceeding those predicted by hydrodynamic film lubrication short bearing theories.

Complete experimental data are given in tabular form. Results are presented by the use of curves and tables.

Test apparatus and test specimens are described by use of words, diagrams, figures, and photographs. Experimental procedures and sample calculations are given.

Suggestions for further research investigations and a pertinent bibliography complete the thesis.

181 pages. \$2.26. Mic 56-143



## AN INVESTIGATION OF STALL FLUTTER

(Publication No. 14,427)

John Marion Simonsen, Ph.D.  
Purdue University, 1955

Major Professor: R. C. Binder

The object of this thesis is to provide more basic information in the study of unsteady-flow phenomena, especially around unsymmetrical bodies with transient angles of attack. The dimensionless flow coefficients relating to the lift, drag, and pitching moment were used in this investigation. This choice was confirmed by the previous widespread use of such coefficients by well known investigators when correlating flow data. Farren, Studer, and Halfman in particular, have measured flow coefficients with oscillating angles of attack, placing emphasis on shapes suitable for use as lifting vanes. However, there still remains a wide area in this field of knowledge in which no fundamental data relating to transient flow is available.

With this object of obtaining additional data, new apparatus has been designed and developed to permit measurements of lift, drag, and pitching-moment coefficients. The work required that the apparatus be constructed in two sections; designed for measuring steady-state coefficients only, and designed for measuring transient coefficients. In the first configuration, a simple beam-fulcrum system was used to check previous research, while in the second, a more complex arrangement allowed the simultaneous measurement of angle of attack and instantaneous fluid forces, which were then used to calculate either lift, drag, or pitching-moment coefficients as required.

To obtain these basic measurements air velocities varying between ten and fifty feet per second with a resultant value of Reynolds number ranging from  $1.9 \times 10^4$  to  $9.7 \times 10^4$  were used. In obtaining data relative to the steady-flow conditions, the angle of attack was varied through 360 degrees, while for transient conditions this angle varied cyclically from 157 degrees to 180 degrees with a frequency of 0.5 cycle per second.

The results obtained effectively showed the influence of the shifting boundary layer on the value of the flow coefficients as the angle of attack varied. The change in the flow configuration around the body involved a time lag which similarly affected the fluid forces acting on the body. This effect, which has been called a hysteresis effect relating to flow coefficients, causes more than one value of the flow coefficient to be obtained for each angle of attack. Its influence was more pronounced in the work relating to pitching-moment coefficients, but it was found to be present for lower air velocities and influenced all the lift and drag coefficients determined.

This investigation showed that the velocity of air affected the hysteresis relating to the various coefficients, in that for a fixed oscillation frequency, hysteresis decreased with the increasing velocity, while in the case of the pitching-moment coefficient, the hysteresis reversed direction before becoming insignificant. The graphical results relating to this hysteresis change indicated clearly whether energy was being transferred from the oscillating body to the fluid stream or in the reverse direction, an analysis which could conveniently be related to the pitching-moment curve only, as the motion of the models was oscillatory but not translatory.

This research contributes fundamental data and knowledge relating to the problem of uncontrolled oscillation of excessive magnitude in many engineering structures such as suspension bridges, telephone and power transmission lines, smoke stacks, and under water structures. Under the influence of fluid-flow forces these bodies experience a natural low frequency vibration which may lead to destruction. The phenomenon has been given the name of "galloping structures". In spite of its importance, the problem of predicting critical conditions which give rise to galloping structures has not been completely solved. This is undoubtedly a result of lack of information of the type which this investigation provides by showing that at low velocities of air flow, a torsional energy transfer occurs between air stream and structure resulting in the incidence of torsional vibration, which in turn allows further translational energy transfer between fluid stream and structure until destruction occurs.

By broadening the knowledge of unsteady flow around unsymmetrical bodies, this investigation has not only laid a firm basis for further studies of unsteady-flow conditions, but has also supplied fundamental data for a rational study of the galloping-structure phenomenon mentioned. It thus provides a means of overcoming the damaging physical effects association with unsteady fluid flow conditions.

95 pages. \$1.19. Mic 56-144

## ENGINEERING, METALLURGY

FACTORS AFFECTING THE BETA  
BRASS SUPERLATTICE TRANSFORMATION

(Publication No. 15,396)

Fred Ellsworth Bowman, Ph.D.  
Purdue University, 1947

Major Professor: F. J. Eckel

The effects upon the superlattice transformation of substituting small amounts of aluminum, silicon and manganese for copper in beta brass has been investigated. Electrical resistance measurements indicate that five atomic per cent aluminum and silicon permit the complete suppression of the transformation, if the alloys are quenched from 1000°F. 2.5 atomic per cent manganese is sufficient to produce the same effect.

In the alloys retaining the disordered state at room temperature, an appreciable expansion of the lattice parameter is noted.

It is proposed that the effects of the added elements can be explained by the non-homogeneous stress placed upon the brass crystal lattice by their presence. The manner in which these stresses are imposed is discussed.

60 pages. \$1.00. Mic 56-145



# EFFECT OF RATE OF DEFORMATION ON INTERGRANULAR FAILURE OF ALUMINUM NEAR THE MELTING TEMPERATURE

(Publication No. 15,360)

James Richard Cady, Ph.D.  
Stanford University, 1955

In this investigation the tensile strength and ductility of high purity aluminum and of aluminum-silicon alloy samples were measured at temperatures near the melting point and at strain rates of  $4 \times 10^{-4}$ ,  $4.5 \times 10^{-2}$  and 4 inches per inch per minute. The work was planned with the objective of investigating some of the mechanisms which may be responsible for the hot tearing which is troublesome during the solidification and cooling of some aluminum alloys. A change in the mechanism of elongation, from plastic deformation primarily dependent upon slip, to deformation primarily dependent upon grain boundary sliding was observed to occur at a temperature within a few degrees of the start of melting. This change in deformation was accompanied by a loss of most of the ductility and a change in the type of fracture to intergranular tearing. The ductility of samples tested below this temperature of embrittlement increased with increased strain rate, but above the embrittling temperature samples tested at low strain rates had higher ductility.

Pure binary solid solution alloys of aluminum and silicon were examined at the same strain rates and at temperatures above and below the solidus. Some tensile strength was measured in these samples at temperatures well above the solidus but there was little ductility and the fracture occurred by intergranular tearing. Single crystals of both pure aluminum and of aluminum-silicon solid solution alloys were highly ductile at all temperatures. The high temperature embrittlement of polycrystalline samples was associated with the structure of the grain boundary. The test results for both pure aluminum and aluminum-silicon alloy samples indicated that failure could occur by hot tearing between the crystal grains below the solidus temperature as well as during the last stage of freezing.

Melting in all samples was observed to begin at the grain edges. In pure aluminum samples the liquid appeared to wet the grain faces, but in the aluminum-silicon alloy samples the liquid appeared to remain on the grain edges as the temperature was increased above the solidus so that wetting of the grain faces did not occur until an appreciable amount of the sample had melted. The tests on pure aluminum indicated that the interfacial surface energy of the grain boundaries was not sufficient to depress the melting point at the boundary by more than  $0.2 - 0.5^\circ\text{F}$ .

152 pages. \$1.90. Mic 56-146

## FINE ARTS

# EFFECTIVENESS OF ART TEACHERS IN MEETING THE NEEDS OF ADOLESCENTS

(Publication No. 15,344)

Richard LeRoy Gunn, Ed. D.  
Stanford University, 1955

## Purpose of the Study

The primary purpose of this study was to obtain behavioral criteria of ways in which art teachers meet the basic needs of adolescents engaged in art activities.

## Acquisition and Treatment of the Data

An adaptation of Flanagan's Critical Incident Technique was employed as the research tool in interviewing 546 high school art students in Utah and California. These interviews produced 465 critical incidents of ways art teachers were effective in meeting adolescent needs, and supplementary material in four areas.

Classification of the incidents was accomplished through the process of category formulation. Six major categories, fourteen sub-areas and forty-six unit divisions were classified under both effective and ineffective behavior. Behavioral definitions were given in the form of direct quotes from the respondents. The various categories were examined in terms of the sex, year in school, and the socioeconomic level of the students.

## Effective Behaviors

Adolescents cited incidents of ways art teachers were effective in meeting adolescent needs:

- I. Providing self-enhancement through commendation on the student's work, personal appearance, personal qualities, or displaying his work in a favorable way before others.
- II. Providing special guidance that contributed to a better definition of the student's phenomenal self, or assisted in his adjustment with his environment in social, mental, emotional and vocational orientations.
- III. Providing specific subject matter, particularly shading techniques, figure drawing, art theory, variations in media, and the perception of the environment.
- IV. Employing certain instructional procedures involving exact instructions in sufficient detail to eliminate ambiguity, criticism for disciplined approaches, general critique, and demonstrating working procedures for effective use of tools, equipment and work habits.
- V. Employing highly individualized instructional procedures for extensive student freedom, thorough respect for student ideas and individual styles, or an offering of special individual assignments involving prestige, friendship, success, special interests, or remuneration.



- VI. Promoting favorable rapport for a pleasant classroom atmosphere with a friendly, stimulating personality, an efficiently managed classroom, and a challenging program of study.

#### General Conclusions

1. That art teachers have been effective in meeting a wide range of specific adolescent needs but not as wide a general range as the optimistic art education literature suggests.
2. That a sensitivity on the part of the art teacher to the needs of high school art students appeared to be conducive to individual growth of the student with a concomitant acceleration in the art program objectives.
3. That mental hygiene in the art room is fostered in some students and inhibited in others.
4. That no one area of art instruction, or no one specific behavior of an art teacher is likely to be accepted by all students, insofar as they perceive their need realizations.
5. That individual differences were operating in the perception of individual needs, and in the manner by which they may be met.

6. That a highly varied art program is essential for a significant contribution to student needs.

7. That specific subject matter is less important than the manner by which it is presented or the frame of reference of the students.

8. That sex differences were not statistically significant.

#### Recommendations

1. That a study be initiated on mental hygiene in the art classroom with both positive and negative aspects studied.
2. That a study be initiated of the student type noted in the present study that feel that they have never had a need met in an art activity nor a satisfying experience in art.
3. That teacher training institutions should: (1) increase the amount of instruction in guidance for the prospective art teacher, (2) not sacrifice instruction of procedural skills for a singular competency in art, and (3) not sacrifice a broad professional art training.

196 pages. \$2.45. Mic 56-184

## GEOGRAPHY

### THE HISTORICAL GEOGRAPHY OF ANTE-BELLUM NASHVILLE

(Publication No. 15,461)

Hollis Phillip Bacon, II, Ed.D.  
George Peabody College for Teachers, 1955

Major Professor: J. Russell Whitaker

This is a study of the development of man's occupancy and use of the Nashville area from the time of settlement by the Mound Builders, nearly one thousand years ago, to the Civil War. It is designed to recreate through text and maps the several stages in the development of ante-bellum Nashville. The rationale for a study of this type is that through it we may be able to discover more complete answers to the problem of interpretation of the city, both as it has been at different times in the past and as it is today.

Three distinct stages in the development of ante-bellum Nashville have been recognized: the first settlements on the Nashville site — aboriginal, trading post, and pioneer; the city during its emergence, from its creation by the General Assembly of North Carolina in 1784, to 1820; and the city during the era of the steamboat, from 1820 to 1860.

During the more than four centuries that the Mound Builders occupied the Nashville site, they established a comparatively large and prosperous aboriginal settlement. For some unknown reason they left their town in the fifteenth century. The site then remained unoccupied until the mid-seventeenth century, when the Shawnee Indians built a stockade on the Bluff of the Cumberland. Driven by almost continual incursions, however, they were unable

to expand beyond the nucleus and finally abandoned the site in 1714. In the meantime, French voyageurs had established a trading post on one of the ancient Nashville mounds. Several French traders lived on the site before the first permanent white settlers arrived in the winter of 1780.

The Nashville settlement was established under the auspices of the Transylvania Company, who acquired the land at the Treaty of Sycamore Shoals in 1775. Physical conditions favoring settlement at the site were: the high bluff of the Cumberland that gave command of the river, a navigable river that connected with the Mississippi, and a large salt spring which provided a commodity greatly in demand in frontier settlements.

The principal function of Nashville during the years of its emergence as a city was that of a trade center for the surrounding agricultural land. This agricultural base was largely devoted to the production of a plantation crop, cotton, which was raised from the first year of settlement. As no important markets lay to the north and no good roads ran east, the only satisfactory outlet for the products of Nashville's service area was the Mississippi River.

Nashville's first steamboat docked on March 11, 1819. Thereafter, until the time of the Civil War, the steamboat played a dominant role in Nashville's life. The importance of the river was much in evidence in the ante-bellum landscape of the city. Both its settlement outline and street pattern reflected riverine characteristics. Nashville's evolution to its place as the commercial and financial center of Middle Tennessee was also due largely to its river location. The construction of a system of hard-surfaced turnpikes made the port of Nashville accessible to the majority of Middle Tennessee's farmers. As early as



the 1830's, however, some prophetic citizens had already recognized that the city's growth might eventually be retarded due to the competition of other cities for the trade of the outlying parts of its service area.

Manufacturing was always limited in ante-bellum Nashville. On the eve of the Civil War the city's trade was valued at ten times that of its manufactures. Nashville's functions as a political, educational, and recreational center, however, had earned for the city a position of importance that extended far beyond Middle Tennessee.

273 pages. \$3.41. Mic 55-147

**THE SASKATCHEWAN RIVER BASIN,  
CANADA: A GEOGRAPHICAL APPRAISAL  
OF THE WATER RESOURCES**

(Publication No. 14,510)

Craig Duncan, Ph.D.  
The Ohio State University, 1955

The Saskatchewan River Basin lies athwart the three Prairie Provinces of Canada. Planning within a basin such as this must be based on a comprehensive knowledge of the physical resources. In this study the writer's interest is in the characteristics of the water resource and their modification in terms of present and possible future withdrawals. The study involved a collation of published material with the field work, interviews, and analyses of both climatic and hydrometric statistics.

Both the volume and the regimen of stream flow are a function of the physical controls within the basin. Precipitation and stream flow maxima are concentrated in the summer months. The mountainous region, that of heaviest precipitation, is the source area for most of the water which flows across the basin. At Edmonton, although only 22 per cent of the North Saskatchewan catchment has been drained, 89 per cent of the runoff has been collected. The details of flow were examined and the temperature factor considered in relation to snowfall and the period of freeze and thaw.

An examination of the relationship between relief and runoff resulted in outstanding contrasts between the mountains and plains. In the mountains a much higher percentage of the precipitation becomes runoff. The indirect effect of relief in modifying the climate was also considered.

Coniferous forest, deciduous parkland, and prairie or steppe grassland form the dominant vegetation communities. By intercepting precipitation and by impeding runoff to varying degrees, they are factors modifying both the volume and the regimen of streams. The various soil types also influence the amount and rate of runoff.

An analysis was made of the hydrometric statistics in terms of the controls of flow conditions. Runoff per square mile decreases rapidly away from the mountains. As the rivers increase in length over the plains, the variation from the average flow increases. The two main tributaries join at The Forks to form the Saskatchewan River. Under average conditions the contribution of the South Saskatchewan is the larger, being 56 per cent of the total. The North Saskatchewan River has the more reliable flow as the annual variation in average runoff is about 30 per cent lower than that of the South. At The Pas the main river has an average annual runoff of 17,822,285 acre feet.

Modification of flow as a result of withdrawal was of little significance over most of the basin. On the Bow and the St. Mary rivers withdrawal for hydroelectric generation and for irrigation may appreciably affect the volume and the regimen of the South Saskatchewan River, especially in low flow years.

It was concluded, following a survey of the groundwater resources, that limited supplies are located in the sand and gravel lenses of the glacial drift, but the more reliable wells penetrate to bedrock although the poor quality is sometimes a factor limiting use.

Under average conditions it was found that 94 per cent of all runoff and consistently over 90 per cent of the monthly flow is carried to Lake Winnipeg. In terms of these figures, water is a surplus commodity. The deficiency is regional in character and is confined to the Bow River and to the semiarid areas which could not be economically supplied with surface water. It was found that, with greater cooperation, there is sufficient water for present needs over the whole of the basin.

More water should be made available if the semiarid section of the basin is to be effectively utilized. The more advanced projects to bring water to these drier areas, if constructed, would not seriously deplete the surface flow. Alternate sources of energy have recently been made available, and these have been utilized to generate electricity. In utilizing oil and gas for this purpose, water allocations may be more specifically considered in terms of irrigation use. Extension of the irrigated area is an essential part of the basin's development. For this purpose there is no substitute for water.

319 pages. \$3.99. Mic 55-148

**THE LOCALIZATION AND THE RELOCATION  
OF MANUFACTURING WITHIN THE CHICAGO  
URBAN AREA: AN ANALYSIS BASED ON A  
RANDOM SAMPLE OF 258 INDUSTRIES WITHIN  
26 SAMPLE AREAS SELECTED AT FIXED  
INTERVALS ALONG A TRAVERSE LINE FROM  
THE LOOP TO THE NORTHWESTERN  
SUBURBAN-FRIDGE**

(Publication No. 15,159)

Martin W. Reinemann, Ph.D.  
Northwestern University, 1955

This dissertation provides an analysis of local site characteristics and industrial relocation in three industrial zones of the Chicago Urban Area (Inner Zone, Outer Zone, and Suburban-Fringe Zone) as ascertained from interviews in sample areas in each zone. It provides explanations for some of the decentralization of manufacturing that has been occurring in this area, but it also attempts to compare and contrast the conditions in each of the zones which manufacturers find favorable or unfavorable.

Existing data on the character, pattern of distribution, and relocation of manufacturing in the Chicago Metropolitan Area is reviewed and the inadequacies are presented. The route of traverse followed in sampling these zones, the sampling technique, and the interview procedure is explained. The results of sampling are compared with census and other existing data to demonstrate the general effectiveness of the



sampling. Such comparisons indicated that an adequate sample of manufacturing was obtained as to type, size, and location of plants.

An analysis of the advantages and disadvantages for manufacturing in each of the three zones revealed the following:

(1) The disadvantages of the Inner Zone are associated with scarcity of land; unattractiveness of much of the area; street and parking congestion; instability of future land use; and the frequency and undesirable nature of city factory inspections, solicitations, and related political considerations.

(2) The advantages of the Inner Zone are nearness to market, nearness to supply houses; nearness to a large net of public transportation routes, accessibility to truck transportation; superior community services as telephone, postal, sewage disposal, water, and fire and police protection; easy access to out-of-town customers; proximity to many other manufacturers; and proximity to a large, unskilled labor market within the Inner Zone.

The conclusion is reached that the Inner Zone conditions seem particularly favorable to local-market manufacturers, job-shops, apparel manufacturers, small marginal producers, and manufacturers who can efficiently utilize multi-storied buildings.

(3) The Outer Zone has a transitional position and considerable contrasts within its limits, but the advantages and disadvantages are rather similar to those of the Inner Zone, except in degree. The principal attractions seem to be for moderately-sized, modern, one-story factories which can locate in areas adjacent to attractive residential neighborhoods; and for large factories that can utilize multi-storied buildings.

(4) The primary disadvantages of the Suburban-Fringe Zone are, in the main, associated with inadequate and expensive community services, a rather limited labor market, and inaccessibility to customers.

(5) The principal advantages of this zone are in the amenities generally associated with suburban areas; with abundant, reasonably-priced land; and with greater freedom from zoning ordinances and city inspectors.

This zone appears to be most suitable to large, successful companies that can readily absorb relocation costs and the higher costs of suburban services; companies that serve national or international markets; "nuisance" types of industries; and companies owned or operated by persons who prefer the amenities associated with the suburbs.

The final phase of this study is an analysis of the trend and pattern of industrial relocation and the reasons why sampled companies relocated. A very high proportion of relocation was noted during the period since 1946, and, rather interestingly, the movement pattern was found to closely follow the direction and route of the traverse used in the study. Lack of suitable space for expansion was the chief reason for moving, although loss of lease, eviction, desire to own rather than rent, and desire to obtain a better site were also given as important reasons.

239 pages. \$2.99. Mic 56-149

# THE FUEL AND POWER BASE OF THE NORTHERN IRELAND MANUFACTURING INDUSTRIES: A MAJOR ECONOMIC LINK WITH THE BRITISH MAINLAND

(Publication No. 15,164)

Robert Sinclair, Ph.D.  
Northwestern University, 1955

Northern Ireland is an important region of manufacturing activity, despite a lack of raw material resources and of a local market for its products. One of the significant deficiencies is that of a fuel and power base. The source of Northern Ireland's fuel supply is on the British mainland. This study analyzes the fuel and power requirements of Northern Ireland's industries, determines the sources of fuel, analyzes the movement of fuel to Northern Ireland and the distributing of fuel and power to industry within Northern Ireland. In this way, it provides an understanding of a very important aspect of the region's economy.

1. Northern Ireland's economy is characterized by the pre-dominance of manufacturing. Four main groups, - textiles, clothing, engineering and food, - dominate the industrial structure. Each group has a different distributional pattern, but in aggregate, manufacturing shows an outstanding concentration in and around Belfast, with secondary concentrations in the south Lough Neagh lowlands, in the Londonderry and the Newry areas.

2. All the main manufacturing groups, as well as the less important mineral products group, are significant fuel and power consumers. Coal is the dominant fuel used. Power is now mainly derived from public, coal-fired thermal electric stations. The fuel and power requirements of the various industrial groups vary. These are analyzed and the areal pattern of the manufacturing industries' fuel and power consumption is determined.

3. Fuel sources are on the British mainland. Coal for Northern Ireland is produced in no fewer than seven areas. The dominant trend is the declining importance of the traditional West Coast fields and the increasing importance of the Yorkshire and north Notts-Derby fields. Fuel oil is obtained from coastal refineries in the Mersey and Southampton estuaries.

4. The bringing of fuel and power to the manufacturing industries involves three steps: (i) Pit to port movement, (ii) cross channel movement, (iii) distribution of the various commodities within Northern Ireland. Analysis of the first two steps emphasizes the difficulties involved in bringing coal from the Mid-English area and the relative ease and cheapness of bringing coal from the Scottish and Cumberland areas.

5. When the various steps are viewed collectively, it is seen that, although the cost of the last step, - the distributing of fuel and power within Northern Ireland, - is considerable, its relative cost in final fuel costs, has declined significantly in recent years. It is also seen how, with the increasing proportion of coal coming from the English Midlands, the handicap faced by the Northern Ireland manufacturer with respect to his fuel and power supply, has been increasing. Although government subsidy now raises the direct burden from the manufacturer, the region's economy is still adversely affected by the location of its fuel and power base.

A study of Northern Ireland's own fuel and power resources, however, points up their insignificance. Northern



Ireland's manufacturing industries will continue to depend on the British mainland for their fuel and power base. This economic link will remain one of Northern Ireland's major ties to the British mainland.

289 pages. \$3.61. Mic 56-150

#### LAND USE IN THE ENGLISH FENS

(Publication No. 15,167)

Kenneth Thompson, Ph.D.  
Northwestern University, 1955

This dissertation undertakes to describe and analyze current land utilization in the English Fens. The Fens form a compact and distinct region, formerly marsh but now reclaimed, covering some 800,000 acres and comprised of the lower floodplains of rivers draining to the Wash. The region has for its main characteristics poor natural drainage, extreme flatness, and low elevations. These peculiar physical characteristics result from the accumulation of deposits, mainly peat and silt, within a shallow basin structure at heights around present sea level.

The soils of the Fens possess high fertility and the region includes some of the most productive farmland in Europe. The Fens represent the largest continuous tract of first class arable land in the British Isles. However, in a state of nature the Fens consisted of swamps and lakes, much cut up by numerous meandering streams. The area was of little value economically until the introduction of artificial drainage and, although drainage works were attempted earlier, it was not until the seventeenth century that large scale effective drainage was initiated.

From this period dates the modern phase of land utilization and the beginning of the transformation from a hunting and collecting type of economy to the present intensive arable farming. The existing complex drainage system of the Fens, essential to the fenland farmer, has evolved from these seventeenth century works.

Part I of the dissertation is devoted first to indicating the predominance of agriculture over other forms of economic activity in the Fens and then to outlining the historical development of the region — both physical and human. Part II of the study is concerned with present-day land utilization and is based primarily on field work carried out during 1953 when interviews and land use mapping were carried out in representative sample areas. This information was supplemented by data from official sources, principally the Agricultural Census of the Ministry of Agriculture and Fisheries and the Farm Economics Branch of Cambridge University.

In Part II an examination is made of the methods of fenland drainage whereby excess water is collected and commonly pumped away, and the rivers are embanked, re-routed, sluiced, and otherwise modified. Land drainage is considered first in general terms and then in detailed studies of representative examples of river and local drainage.

A general survey of cultivation in the Fens is followed by detailed examination of the major agricultural products of the region — small grains, potatoes, sugar beets, market garden crops, fruit, and grass. The place in the fen scheme of farming of these, and other crops, together with livestock, is considered and a study is made of the remarkable environmental influences which affect their production in the fen region. The final chapter summarizes the findings of the dissertation and in conclusion suggests measures which may be taken to enhance and conserve the agricultural value of the Fens for future years. 324 pages. \$4.05. Mic 56-151

#### GEOLOGY

##### STRATIGRAPHY AND PALEONTOLOGY OF THE JACKSON GROUP OF GEORGIA

(Publication No. 15,446)

James Frederick Louis Connell, Ph.D.  
The University of Oklahoma, 1955

The Ocala limestone crops out from the southwesternmost counties northeastward to northern Dooly County, and its lower portion, the Tivola member, continues northeastward as a tongue or wedge into the lower part of the Barnwell formation. The Barnwell formation crops out from central Sumter County northeastward to the Savannah River.

The Ocala limestone of Georgia is the upper part of the formation, known in Florida as the Ocala "restricted" or Crystal River formation. The principal area of outcrop of the Ocala in Georgia occurs between the Flint and Chattahoochee Rivers, where the rocks consist of white to cream-

colored to pink, soft to hard, in places silicified, fossiliferous limestone, containing a prolific fauna of Upper Jackson age.

The Tivola member consists of soft, fossiliferous, white to cream-colored limestone, with sand in its lower portion. The Tivola member underlies the Twiggs clay member of the Barnwell formation from northern Dooly County, north-eastward to south of Gordon.

The Twiggs clay member consists of fuller's earth type clay, cropping out from Sumter County to the Savannah River. In east-central Georgia, the Twiggs clay member is overlain by the red to white sands of the Irwinton sand member, which is thickest in east-central Georgia. At a few localities the Irwinton sand member is overlain by coarse, red sand and beach pebbles, referred to as the Upper Sand member. In Washington County, a much localized unit, known as the Sandersville limestone member, lies at or near the upper part of the Irwinton sand member, and contains the faunules characteristic of the Tivola member to the south. Stratigraphically younger Barnwell strata above the Upper



Sand and Irwinton sand members occur in northeastern-most Georgia.

The Ocala and Barnwell formations are contemporaneous deposits of Upper Jackson age. The Ocala represents a shallow water marine, offshore environment, and the Barnwell represents a littoral facies of coarser material, deposited near the Upper Jackson strand line. The Tivola member represents a short-lived advance of the Ocala sea northward into the present area of outcrop of the Barnwell formation.

The majority of the fossils in strata of the Jackson stage are described from the Ocala limestone. The Barnwell formation is practically barren of fossil remains except for the Foraminifera described from the Twiggs clay. Only two localities where the Twiggs clay is exposed yield a large molluscan fauna. The Sandersville limestone member contains echinoids, pelecypods, and gastropods, along with a few bryozoans with Tivola-Ocala affinities.

Fossils described from the Jackson beds of Georgia number sixty-six species of pelecypods, two of which are new, twenty-one species of gastropods, twenty bryozoans, fourteen echinoids, ten shark teeth, one scaphopod, one crab, one coral, one orbitoid foraminifer, and two worm-like structures. These remains are illustrated, and included in the Faunal Distribution Chart.

383 pages. \$4.79. Mic 56-152

# ROCKS AND STRUCTURE OF THE NORTHEAST PART OF THE SODA MOUNTAINS, SAN BERNARDINO COUNTY, CALIFORNIA

(Publication No. 15,368)

Lucius Trowbridge Grose, Ph.D.  
Stanford University, 1955

The geology of 100 square miles in the northeast part of the Soda Mountains just west of Baker in the Mojave Desert was mapped on aerial photographs of scale 1:13,000. Petrologic and structural interpretation has been based on this work.

An important N20W right-lateral fault, herein named the Soda-Avawatz fault, divides the region into two distinctly different geologic areas. In the eastern area the following rocks occur: (1) metasediments of probable pre-Cambrian age, (2) the Prospect Mountain quartzite which is thought to be Lower Cambrian, (3) dolomite of Middle Paleozoic (?) age, and (4) a complex of plutonic rocks ranging from diorite to granite.

The western area consists of: (1) Mississippian-Pennsylvanian limestone and hornfels, (2) Lower Permian limestone of the Bird Spring formation, (3) Lower Triassic limestone and shale, (4) Triassic-Jurassic andesite and quartzite herein named the Soda Mountain formation, and (5) Late Mesozoic intrusive rocks different from those in the eastern area.

In the eastern area, Lower Cambrian (?) quartzite of restricted extent comprises an isolated thrust complex, and intensely deformed Middle Paleozoic (?) dolomite occurs in klippen which are intruded by plutonic rocks. In the western area, highly disordered allochthonous Upper Paleozoic limestones occur in small and large fragmentary

blocks. These are irregularly down-faulted into an equally disordered autochthon of Mesozoic volcanic rocks. The thrust complex was passively intruded by Late Mesozoic quartz diorite, quartz monzonite, and granite. The intrusions effected unusually large zones of contact metamorphism (garnetization) and regional hydrothermal alteration (albitization and epidotization).

Several thousand feet of Lower Pliocene "Avawatz beds" consisting of fanglomerate, sandstone, and monolithologic limestone breccia occur in the district, and are prevalent along the Soda-Avawatz fault zone. The limestone breccia originated by landsliding and normal fanglomerate accumulation coeval with oblique-slip movement of the Soda-Avawatz fault.

Deformation took place during the Middle and Late Mesozoic and is considered part of the Nevadan-Laramide orogeny. This resulted in isoclinal folding, thrusting, and block faulting. The upper plates of the thrusts are believed to have moved westward with respect to the lower blocks, but the evidence is inconclusive. Granitic intrusion followed deformation and was locally guided by pre-established vertical and low-angle faults.

The Soda-Avawatz fault zone is the most prominent structure in the Soda Mountains. Varying in width from one to two miles, it consists of three principal through-going faults and numerous branching faults characterized by wide zones of granulation and rock slivering, near-horizontal slickensides, and apparent reversal of throw along the strike. A large anticline is squeezed up within the fault zone. Most of the movement occurred during Late Cenozoic, but features indicating recent movement are lacking. The strongest evidence for right-lateral displacement is the en echelon arrangement of folds and secondary faults. Since specific geologic features in the Soda Mountains cannot be matched across the fault, the amount of displacement is unknown; it is estimated, however, to be at least three miles horizontally.

The Soda-Avawatz fault continues northward along the east side of the Avawatz Mountains and joins the Death Valley fault. Together they form a regionally significant northwest-trending right-lateral fault zone. More recent movement on the east-west Garlock fault has forced an eastward bulge in the Death Valley - Soda-Avawatz fault where the faults join on the northeast side of the Avawatz Mountains.

During most of the Paleozoic and Mesozoic eras, the Soda Mountains area lay in a transition zone between miogeosynclinal environment to the east, and eugeosynclinal environment to the west. The Death Valley - Soda-Avawatz fault seems to coincide with this transition zone, and was perhaps localized by it. 207 pages. \$2.59. Mic 56-153



**GEOLOGY OF THE ORCHARD PEAK  
AREA: KERN, SAN LUIS OBISPO,  
MONTEREY, AND KINGS COUNTIES,  
CALIFORNIA**

(Publication No. 15,392)

Owen Thayer Marsh, Ph.D.  
Stanford University, 1955

The Orchard Peak area covers the southern end of the Diablo Range along the west side of the San Joaquin Valley and lies principally in northwestern Kern County, California.

The oldest rocks consist of bentonitic clay and tuffaceous shale — here named the Hex formation — which occupy the core of a diapir fold. The Hex is dated by belemnites as questionably Upper Jurassic.

South of Avenal Ridge is a thick sequence of dark green shales with calcareous nodules which may be Lower Cretaceous, although no diagnostic fossils were found. It is here referred to as the Badger shale.

Most of the Orchard Peak area comprises six new Upper Cretaceous formations which are, in ascending order: the Risco formation, Johnson Peak formation, Aguila sandstone, Serpiente sandstone, Moonlight siltstone, and Red Man sandstone. Sandstones of the first three are mainly graywackes and those of the last three, arkoses. Submarine flowage folds are conspicuous in the Serpiente. Considerable shale and some conglomerate are intermixed with these units. Six volcanic ash beds occur in the Risco and one in the Serpiente. The highest Upper Cretaceous unit in the area is the Moreno formation.

Eocene rocks crop out in the Devil's Den, Stoker Canyon, and Red Rock synclines. They are represented by the Avenal sandstone, Canoas siltstone member of the Kreyenhagen shale, and the Point of Rocks formation. The area is bordered on the southwest by the McLure shale (Upper Miocene) and patches of the Temblor formation (Lower and Middle Miocene).

Thin bodies of serpentine with chert and other Franciscan-type rocks occur along the Antelope Valley and Aido Spring thrusts and in the core of the Three Peaks anticline.

No comparable region of Cretaceous rocks in California exhibits such structural complexity as the Orchard Peak area. Most of the mapped area comprises the upper plate of the Antelope Valley thrust which has moved at least four miles southward, bringing Cretaceous rocks to rest upon Miocene strata. This upper plate has been broken by a second important fault, the Aido Spring thrust, which has brought Lower (?) Cretaceous beds to rest upon rocks of late Late Cretaceous age, producing a stratigraphic separation of nearly two and a half miles. Both thrusts are marked by sliver-like serpentine bodies. The Hex thrust sheet, on the other hand, has moved at least two miles southward (as shown by a small klippe), causing upper Upper Cretaceous sandstones to override all older units. Several other zones of thrusting occur within the Cretaceous, forming an imbricate pattern. Numerous right lateral tear faults have also developed; and one of these, the Polonio Pass fault, has a displacement of more than a mile.

Two anticlines and six synclines occur within the mapped area. The Three Peaks ("Diablo") anticline is a diapir fold with a core of serpentine. The thrust-faulted Avenal Ridge anticline, also a piercement fold, has a core consisting of the Hex formation.

The structural features of the Orchard Peak area and the nearby San Andreas fault may have both been caused by NNE-SSW compression. The deformation is at least post-Late Miocene, probably late Pliocene or early Pleistocene.

The Cretaceous sediments were apparently derived from several different sources, probably nearby islands, and were deposited in a shallow sea whose bottom subsided in the manner of a geosyncline. Land areas were evidently clothed with vegetation, indicating a humid climate.

Fossils are very scarce or absent throughout most of the Cretaceous section, becoming moderately abundant in the uppermost units. Here they include straight and coiled ammonites, nautiloids, various pelecypods and gastropods, hydrocorals, and Foraminifera.

Although oil prospects are not encouraging in the Orchard Peak area, two possible well sites are suggested. Other products of economic interest include drilling mud, road metal, and water. 243 pages. \$3.04. Mic 56-154

**A REGIONAL STUDY OF THE  
AMSDEN FORMATION**

(Publication No. 15,379)

Philip Amos Mundt, Ph.D.  
Stanford University, 1955

The Amsden formation has long been a controversial unit in the northern Rocky Mountain area. Recent work in the Williston Basin has done little to solve any of the problems; in fact, new difficulties have been encountered. Over the shelf area of Wyoming, Montana and the Dakotas, the Amsden formation or equivalent strata is present as a fairly regular, widespread unit. Gross correlations are normally not difficult, except in the Minnelusa facies, yet numerous problems have arisen and are still largely unsolved. These involve: (1) the age of the Amsden formation, (2) the position of the Mississippian - Pennsylvanian time boundary, (3) the correlation of various sands at the base of the Amsden (in the central Montana region), (4) the nature and position of the Heath - Amsden and the Amsden - Tensleep lithologic boundaries, and (5) the relationship between the Amsden and Minnelusa formations.

During the winter and spring months of 1954 the literature pertaining to the Amsden formation was critically examined and abstracted. In the summer of 1954 more than 36 pertinent outcrop sections were studied and described in detail. Rock specimens were taken as sampling required and fossils were collected wherever found. During the fall and winter months of 1954-55 the information from more than 240 wells was examined, and detailed sample descriptions made of well cuttings, wherever available or where control was required. Laboratory work, identification of fossils, construction of maps, etc., was conducted concurrently with the subsurface work.

From the regional study two major proposals can be made concerning geologic conditions in the central Montana region. The first of these is the recognition and naming of an old tectonic element which was active in the area during late Chesteran time. The position, areal extent, structural significance, and time of uplift have been studied and defined in this report. The second proposal concerns the need for a new formational term for an unnamed and poorly



understood unit which is found between the Heath and Amsden formations. The unnamed unit has been called the Heath-Amsden "transition zone", "non-marine Heath", "basal Amsden", etc.; it appears to be restricted to the east-central part of Montana and western North Dakota. No specific formational name is proposed at this time, pending further field search for a satisfactory type section. The unnamed interval is the offspring of tectonic activity in the area, and is, therefore, related to the old uplifts such as the Chesteran arch which has been mentioned. The extensive oil accumulations which are known in central Montana will be shown to be vitally influenced by the ancestral uplift and the nature of the unnamed formation.

The regional study has also made possible a better understanding of other geologic factors relative to the Amsden formation. Some of the tentative conclusions arrived at as a result of this study are:

(1) The name Darwin is preferred to "Dorwin" for the basal sandstone in the Amsden formation.

(2) The hematite "buckshot" pellet horizon found in the red shale unit of the Amsden formation is of particular value for stratigraphic reasons. The "buckshot" marker bed strengthens correlations between the type sections of the Sacajawea and Amsden formations.

(3) Radioactive zones in the Minnelusa formation may help to extend Amsden and Tensleep terminology toward the Black Hills area.

(4) Sedimentation in the evaporitic (Minnelusa) area was controlled by a structural element which served as a "bar" isolating the depositional basin.

411 pages. \$5.14. Mic 56-155

#### THE LOWER DEVONIAN HELDERBERGIAN SERIES OF CENTRAL NEW YORK, A STRATIGRAPHIC AND PALEOECOLOGICAL STUDY

(Publication No. 15,425)

Lawrence Vroman Rickard, Ph.D.  
Cornell University, 1955

Recent investigations in the Upper Silurian and Lower Devonian strata of New York reveal that considerable revision of the stratigraphy, paleontology, correlations and systemic references of these beds is necessary. Consequently, a detailed study of all the strata above the Salina formation to the base of the Oriskany sandstone of central and eastern New York has been undertaken. The most important results of this study are as follows:

1. Five phases of deposition characterize the Helderbergian Series of New York. These are represented, in part, by the Rondout, Manlius, Coeymans, Kalkberg, and New Scotland formations. Each of these formations was deposited in a particular environment, the characteristics of which are inferred from the lithotopes and faunas involved. They represent a sequence of biotopes interpreted

as lagoonal, biostromal, epineritic and infraneritic environments, from the shore to the open sea.

2. These formations are not everywhere of the same age. They become younger as they are traced westward from the Hudson River into central New York along a line more or less perpendicular to the ancient shore. Nearly all of the species known to occur in these units are facies fossils; hence it is difficult to determine time relationships and correlations of these units.

3. When traced westward from the Helderbergs, the Coeymans formation thickens to nearly 100 feet at Cherry Valley. Slightly further west this greatly thickened Coeymans splits into three parts. The lower portion, for which the name Dayville limestone is proposed, grades laterally into the Olney limestone of the Syracuse area. The middle portion rapidly changes into the Elmwood, Clark Reservation and Jamesville members of the Manlius. For the upper beds, which continue westward as far as Chittenango Falls, the name Deansboro limestone is proposed. The Bishop Brook limestone at Manlius is but a reappearance of the Deansboro further west.

4. The evidence now indicates that the entire type Manlius formation near Syracuse in central New York is equivalent in age to the Lower Devonian Coeymans and Kalkberg formations of eastern New York. Consequently, its reference to the Silurian System can no longer be upheld. The so-called Manlius of eastern New York is entirely older; the name Thatcher limestone is proposed for this latter unit. It becomes thinner to the west and is apparently replaced by the underlying thickening Rondout.

5. The Kalkberg formation may be traced as far west as Oriskany Falls. At that locality it is younger, being equivalent to the upper New Scotland of eastern New York. The New Scotland and Becraft formations do not extend much beyond the Schoharie and Cobleskill Valleys.

6. The base of the Devonian System of New York is apparently not at the base of the Coeymans limestone of the eastern part of the state where it has been placed for many years. Present information indicates that the underlying Rondout and Cobleskill formations are probably also Devonian in age. In addition, certain lines of evidence point to a possible Devonian reference even for the Bertie, Brayman and Binnewater formations.

7. It is proposed, in view of these developments, that the term Helderberg be elevated to series rank. The revised Helderbergian Series would include all Lower Devonian strata from the base of the Cobleskill to the top of the Port Ewen.

8. This interpretation of the standard Lower Devonian of New York permits more exact correlations with strata of similar ages in Pennsylvania, Maryland, Virginia and West Virginia. The Keyser limestone of these states is to be correlated with the Cobleskill, Rondout, Thatcher, Coeymans, and Kalkberg formations of eastern New York and with the Cobleskill, Rondout and entire type Manlius of central New York. It is thus largely Devonian in age.

396 pages. \$4.95. Mic 56-156



## HEALTH SCIENCES

### HEALTH SCIENCES, GENERAL

#### NUTRITIONAL SUPPLEMENTATION AND MOTOR PERFORMANCE OF ELEMENTARY SCHOOL CHILDREN

(Publication No. 15,346)

Paul Michael Hillar, Ed.D.  
Stanford University, 1955

The study was an attempt to determine the influence of a nutritional supplement on certain aspects of motor performance of apparently nutritied elementary school students. The nutritional supplementation consisted of the ingestion of specific amounts of multi-vitamins and multi-minerals.

Two general hypotheses were tested:

1. The ingestion of a multi-vitamin and a multi-mineral supplement administered each school day for 26 weeks would increase significantly the motor performance of intermediate elementary school subjects.

2. The supplementation would also result in greater gains in motor performance being made by the older experimental subjects than by the younger.

The study included male and female subjects from six schools in Merced County, California. Medical supervisor for the study was a practicing physician located in the City of Merced, California; he was a member of the County Medical Society and represented that organization. The subjects for the study were randomly selected students from grades four, five, and six and were divided into two sections, one of males and one of females, with an experimental and control group for each section. The number of males in the experimental group totaled 130, with a control group of 137 subjects. The number of females in the experimental group totaled 86, with 80 subjects in the control group. The testing instrument which was employed to measure motor performance was selected items of the Oregon Motor Fitness Test Battery.

A physician screened 500 randomly selected students from the total class registers, observing nutritional status. In his judgement the experimental, control, and non-participating students were nutritionally comparable. The pretest motor fitness scores of the experimental and control groups were compared statistically and they were found to be comparable.

Nutritional supplementation consisting of one multi-vitamin capsule and three multi-mineral tablets for each school day began the first week of November, 1953, and continued until the first week of May, 1954. The experimental groups received the supplement. The control groups received placebos of the same number, shape and size for the same length of time, and under the same conditions; only the colors were different to prevent mistaken identity. All subjects believed they were receiving the vitamins and minerals. The classroom teacher supervised the ingestion. The identification of the supplements and the placebo was known only to the executive director until the study was completed.

The male experimental group made greater mean gains than the control group. The difference was not statistically significant and could have occurred by chance.

The female control group made greater mean gains than the experimental group. The difference was not statistically significant and could have occurred by chance.

In the male subjects the difference between the correlation between age and gain in motor performance for the experimental and control group was found to be significant. The gain was also found to be significantly greater than zero.

In the female subjects the difference between the correlation between age and gain in motor performance for the experimental and control group was negative, but was not found to be significant. It could have occurred by chance.

On the basis of an analysis of the data it could not be concluded that a 26 week supplementation (of the apparently nutritied subjects in this study) had a statistically significant effect on motor performance as measured.

However, a statistically significant relationship was established between age, and gain in motor performance in the male experimental group. This strongly suggests that further research be made to investigate which levels of maturation might benefit most from a nutritional supplementation.

84 pages. \$1.05. Mic 56-157

### HEALTH SCIENCES, NURSING

#### A BACCALAUREATE DEGREE PROGRAM IN NURSING AT SAN FRANCISCO STATE COLLEGE

(Publication No. 15,414)

Evelyn May Pederson, Ed.D.  
University of Houston, 1955

This report is a presentation and interpretation of a baccalaureate degree program in nursing designed specifically for San Francisco State College. It was developed on the basis of regulations of the California Administrative Code and the requirements of San Francisco State College.

The program is intended to develop competent, adaptable nurses, who are well-adjusted as persons and as citizens. It is limited to the education of people for general nursing under supervision. Emphasis has been placed on developing nurses to nurse people rather than diseases. The program has been planned to be within the range of possibilities for the average college student. It is comparable with degree requirements for other disciplines at the college. People of both sexes, and of all social and ethnic groups are eligible for admission.



The program should appeal to a wide variety of people under different circumstances, and should place collegiate nursing education within the reach of a larger number of qualified people than the usual nursing program. Certain aspects of the program may have an appeal to prospective students. Students have time to participate at will in all curricular activities. Students may attend on a part-time or full-time basis, because the classwork and laboratory experience of each course are parallel and completely contained within the semester. If students attend on a full-time basis, the program may be completed within four school years, which is the equivalent of the time required to earn a diploma in a hospital program.

Classes and laboratory experience in nursing conform to the college calendar and are scheduled between eight o'clock in the morning and five o'clock in the afternoon. Theory and laboratory experience in nursing and in liberal arts have been planned to progress simultaneously in each semester, with only one course in nursing scheduled for any single group of students in any one semester. This provides for a maximum amount of correlation and integration. Because laboratory experience in nursing has been assigned credit identical to the usual college laboratory courses, there is a minimum of six hours and a maximum of eighteen hours a week of laboratory experience. Students have an average of twenty-seven hours a week of classes and laboratories. Including an estimated two hours of study for

each hour of classwork, the average work week for the student of nursing is 49.6 hours.

The program consists of 132 semester units of credit, of which sixty are in nursing, sixty-eight in general education and courses related to nursing, and three in elective courses. There are sixty-four semester units in lower division work and sixty-eight in upper division work. There is a ratio of one hour of class to three hours of laboratory experience in nursing and one hour of class to one and one-half hours of laboratory experience in the total program.

Twenty semester units of the nursing major are in the lower division and forty in the upper division. The introduction to nursing occupies the first two semesters with eight units of credit. The fundamentals of nursing are presented in twelve units in the second year. The lower division courses in nursing include an introduction to each of the areas of nursing. Forty semester units have been distributed among the nursing courses on the upper division level: twelve in medical-surgical nursing, eight in maternal-child care, ten in neuro-psychiatric nursing, and ten in community nursing. Concepts from pathology, medical science, diet therapy, pharmacology and therapeutics, history of nursing, and professional relationships have been incorporated in each nursing course where applicable.

205 pages. \$2.56. Mic 56-158

## HISTORY

### HISTORY, GENERAL

#### AN HISTORICAL ANALYSIS OF THE CHANGING FUNCTIONS OF THE PRESIDENTIAL "STATE OF THE UNION" MESSAGE FROM 1790 TO 1955

(Publication No. 13,606)

Seymour H. Ferish, Ph.D.  
New York University, 1955

Chairman: Professor Samuel P. McCutchen

Article II, section 3 of the United States Constitution places the duty upon the President to "from time to time give to the Congress Information of the State of the Union, and recommend to their Consideration such Measures as he shall judge necessary and expedient;..." The growth of the United States and the emergence of presidential leadership in the Federal system has enhanced the importance of the annual message as a political institution.

The practice of having the Executive present a comprehensive communication to the Legislative body had its origin in England where the King delivered a message at the opening of Parliament. In America, the political custom was observed by the royal governors and later, by the state executives. It was this practice in New York State

which provided the basis for the duty imposed on the President by the Constitution.

Washington and his successor, John Adams, fulfilled their obligation in a manner and ceremonial reminiscent of British tradition. The message, delivered orally, was relatively non-partisan, restrained, and in the classic style. The content presented a balance between status reporting, recommendations and general observations.

In 1801, Jefferson substituted the written message for the annual address thereby eliminating much of the ritual associated with the occasion. Gradually, an emphasis on status reporting became perceptible following the Jefferson administration. From the tenure of Madison to the term of Taft, the annual message experienced a steady but discontinuous growth in length with an accompanying attention to factual information. Recommendations and general observations tended to be swallowed in the engulfing concern with the summation of Cabinet reports. Exceptions to the rule during this period were Jackson, Lincoln, Johnson, Cleveland, and Theodore Roosevelt who turned the focus of their annual messages more upon the public than on Congress, and who allotted relatively less space to status reporting.

Wilson, in 1913, reintroduced the annual address and initiated a new pattern of less inclusive messages. The attention of the nation was directed dramatically towards a few overriding issues. Status reporting was held to a minimum; policy projection was maximized.



Harding retained the personal address but favored the multi-purpose message with its emphasis on information. Coolidge discontinued the oral delivery after one appearance and led the way back to the acceptance of the written annual message with its predilection for factual summarizations.

Franklin D. Roosevelt resurrected the Wilsonian format, oral in delivery, specific in purpose. Truman, with two exceptions, employed the address rather than the message while Eisenhower has relied completely on an oral presentation. A return to the emphasis on status reporting has been in the ascendancy since 1945.

Religious thanksgiving was an integral part of the message content from 1790 to around 1874 but from that date until 1934, it lapsed into general desuetude except for the messages of Hayes, McKinley and Wilson. The present trend favors inclusion of religious sentiments.

Confidence and optimism which dominated the pre-1900 annual messages have given way to more realism and candidness especially in the communications of the "reform" Presidents like the two Roosevelts, Wilson and Truman.

Literary style reached its highest levels in the annual messages of those Presidents who were more interested in the policy making possibilities of their office than in its enforcement provisions.

The annual message content provides an invaluable chronicle of American history and supplies an unique insight not only on the "State of the Union" but on the "State of the Presidency" as well. In its pages is reflected the alternating power shift between Congress and the President.

405 pages. \$5.06. Mic 56-159

#### THE METHODIST PERIODICAL PRESS AND TAX-SUPPORTED EDUCATION, 1900-1950

(Publication No. 15,477)

Leonard Young Trapp, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: Fremont P. Wirth

The purpose of the study is to discover the attitude of Methodism, as revealed in the periodical publications of the Methodist Church, toward tax-supported education in America.

The study is limited to research in regional or national Methodist Periodicals that were published from 1900 through 1950.

#### Summary and Conclusions of Methodist Views on Tax-Supported Education

The school curriculum should be a means of conserving the cultural and religious heritage of the nation.

Education for citizenship should prepare the student to assume an active role in coping with the problems of society.

Any efforts to restrict or limit the freedom of tax-supported education have been opposed by Methodism.

Tax-supported education has advanced the cause of international understanding and world peace.

Racial tolerance and understanding as well as the material welfare of ethnic minorities has been advanced by education.

The crime problem has been in part a product of materialism in education. The problem is subject to alleviation by education.

Federal aid to education is needed and desirable. Federal programs of education have been almost universally endorsed. Three fears about Federal aid to education have been the militarization of the schools, the use of Federal money to support parochial education, and Federal efforts to circumvent local control of education.

Additional money is needed to provide for higher salaries for teachers and to build and maintain the school plant.

Some form of non-sectarian religious instruction should be offered in the tax-supported schools. The efforts of the Roman Catholics or any other church to control any phase of education have been condemned.

The greatest weakness of tax-supported education is its emphasis on material considerations at the expense of spiritual values.

Education should not be dominated by any special interest group.

Educational opportunity should be available to all individuals who were the victims of educational neglect.

Education should seek to eliminate both individual and group tensions.

Professional standards of public education have been accepted.

The work of the tax-supported schools is valuable to the work of the Methodist Church.

Methodist writers have supported the school programs that tend to promote some function of a religious organization. Programs that do not carry out a function of religion have been criticized.

Educational change has been approved but criticism has been made of the decline of the older stable elements of education.

Methodism has regarded the tax-supported schools of the United States as a pillar of constitutional government. The free operation of the public schools is essential to democracy.

253 pages. \$3.16. Mic 56-160

#### THE TRANSITS OF VENUS: A STUDY IN THE ORGANIZATION AND PRACTICE OF EIGHTEENTH-CENTURY SCIENCE

(Publication No. 15,441)

Harry Woolf, Ph.D.  
Cornell University, 1955

A pair of infrequent, astronomical events took place during the eighteenth century that excited the educated world, and brought into being the greatest cooperative enterprise in the history of science to that time. Behind this broad, international effort to observe the transits of Venus of 1761 and 1769 from all parts of the globe, was the desire to help complete the Newtonian system of the world by determining its exact scalar dimensions.

The usefulness of the transits of Venus in determining the fundamental unit of astronomical measurement, the solar parallax, or the mean distance of the earth from the sun, was first demonstrated by Edmund Halley in a series of papers published between the closing years of the seventeenth century and the second decade of the eighteenth.



Essentially, this consisted of observing the moments of inner contact between Venus and the sun during the planet's ingress and egress from the solar disk. Observations of this phenomenon from different parts of the globe would lead to differences in the duration of the time which the planet appeared to spend upon the sun, and from this information the solar parallax could be accurately determined. In the years following Halley's death, the transit method was modified by Joseph-Nicolas Delisle so that observations of contact at either ingress or egress would be adequate. Delisle's world-wide correspondence also helped to stimulate interest in the transits everywhere, and through his letters it is possible to take some measure of the breadth and depth of interest which the scientific community maintained in the transits during the years preceding their occurrence.

Primarily because of the efforts of the *Académie Royale des sciences* and the Royal Society of London, but also through the assistance of the crowned heads of Europe and the provincial assemblies of America, astronomical expeditions were despatched to all parts of the world to observe the transits in 1761 and 1769. With skilled observers selected from the substantial reservoir of scientific talent available by the middle of the eighteenth century, and equipped with precise astronomical instruments drawn from the burgeoning industry in scientific instruments of the same period, the expeditions were the best of their kind to date. Though the quality of these expeditionary groups in men and materials was more or less equal, those under British auspices were organized with greater efficiency and suffered less disappointment than those which sailed under French colors.

The calculations derived from the transit observations of 1761 considerably reduced the element of uncertainty in the solar parallax determined by pre-transit techniques. But the general result remained unsatisfactory for what was supposed to be a precise determination of a natural constant. However the fortunate occurrence of transits of Venus in pairs, eight years apart, presented the scientific community with a second chance which it could not neglect. The transit of 1769 was thus observed with the greatest care, and the superior conclusions drawn from its observations were a measure of both the value of the experience of 1761 and the technical improvements which had been made in astronomy during the decade. After 1769, the solar parallax was fixed between limits of 8.43 seconds and 8.80 seconds, within which it has remained to this day.

On the whole, the eighteenth-century attempt to determine the dimensions of the solar system represented a significant advance over the work of its predecessors, even though the degree of precision finally attained fell short of the great expectations which had originally stimulated interest in the transits. This concern for the solar distance however, brought more interests to a single focus than any other scientific problem in the eighteenth century. As such, it has presented a sterling opportunity for examining the organization and practice of science during that period.

372 pages. \$4.65. Mic 56-161

## HISTORY, ANCIENT

### ADVANCEMENT IN RANK UNDER THE ROMAN REPUBLIC AS A REWARD FOR THE SOLDIER AND THE PUBLIC PROSECUTOR

(Publication No. 14,635)

Helen Elizabeth Russell, Ph.D.  
Bryn Mawr College, 1950

The purpose of this study is to investigate the nature of rewards granted in Republican Rome to two types of public servants - the especially deserving military man and the public prosecutor. Perhaps the most important aspect of these awards, as this study tries to show, is the fact that they brought to their winners some advancement in rank.

As a background to the practices of Republican Rome, a preliminary chapter is devoted to an examination of awards offered at Athens. There, rewards to state benefactors consisted mainly of exemptions from certain civic duties. There is some similarity to Roman practices in that both at Athens and at Rome the rewards indicate that in return for one service to the state another service or function or office was to be considered as fulfilled. Since Athenian political life did not include the Roman conception of a *cursus honorum* and the differences between the two political systems are sufficiently great, the information about Greek practices is offered not as a precedent for Roman awards but rather to show that both states considered benefactors of this sort worthy of state awards.

The awards offered to soldiers in Rome are discussed by both Pliny and Gellius, but it is a passage in Livy (23.23.5) which indicates that the *corona civica* brought a political advantage to its holder. To test the practice suggested by Livy, the careers of the recipients of the *corona civica* were examined. Some are too remote or obscure to provide either verification or contradiction. Two winners of the civic crown, however, M. Aemilius Lepidus, consul of 187 B.C., and C. Julius Caesar, had careers which included irregularities which have been much discussed. For Lepidus, the point at issue is his exact status (i.e., whether he was a senator or not) in 201 B.C. when, before holding a curule magistracy, he served on an embassy in the company of two *consulares* who were also ex-censors. For Caesar, there is the discrepancy between the usually accepted date of his birth and the date at which he held the curule offices. In the careers of both Lepidus and Caesar, the award of the civic crown with its accompanying advantages may be an explanation for the apparent irregularities.

For information about the public prosecutor, the rewards mentioned in various laws were considered. Over a period of time, the rewards, known as *praemia legis*, came to include citizenship for the non-citizen, the right of voting in the tribe of the accused, and the assimilation of the condemned man's rank. Such rewards probably served as incentives for the numerous accusations and counter-accusations of the last years of the Republic. A consideration of the careers of the men involved in public prosecutions is revealing. Cicero's prosecution of Verres, besides being an opportunity to enhance his reputation as a lawyer, provided Cicero with Verres' praetorian rank. Other young men, not known to have held office but clearly present in the senate, may have attained this dignitas



through *praemia legis* in prosecutions which they are known to have undertaken successfully.

The study of advancement in rank as a rewards for the soldier and the public prosecutor sheds some light also on the common Imperial practice of bestowing *ornamenta* of office on men who had never held office. The increasingly frequent grants of *ornamenta*, even to questionable groups like the *delatores* and favorite imperial freedmen, probably has as a precedent the sober Republican consideration that a man who had served the state with distinction in war or the lawcourts should have a reward which was not only worthy of his service but advantageous to him in political life.

98 pages. \$1.23. Mic 56-162

## HISTORY, MEDIEVAL

### ADMINISTRATION OF THE ENGLISH CUSTOMS SERVICE, 1307-1343

(Publication No. 13,664)

Robert Lewis Baker, Ph.D.  
Princeton University, 1955

The most notable characteristic of English medieval government was the king's employment of local men to administer the business of royal government in their own neighborhoods and to do this without reward. These men of the counties and the boroughs enforced royal orders and collected royal revenues. In outright administrative costs the employment of such men represented an important saving, but in all other respects this dependence on unpaid service was expensive. Local opposition to royal demands led to flagrant disregard for the king's commands and unabashed cheating in paying royal dues.

The problem of controls came to the fore when Edward III's ministers tried to make the customs service completely responsive to the will of the central government. A customs service had come into existence in 1275 when Edward I received parliamentary approval to tax all wool leaving the realm. Neither Edward I nor his son attempted to establish an efficient system of governmental controls over the service. Edward III made such an attempt. For him the success of supervision gradually became of particular importance, since he depended upon foreign trade to pay the expenses of his wars. He taxed wool at rates considerably higher than those customarily levied in the past and manipulated the wool trade itself to serve his military needs. To wool producers and wool merchants alike his actions were unbearable. The local areas resisted the king's demands. Only loyal agents of the king in the ports could have made the royal will prevail. From 1331 the government of Edward III searched for the right men to supervise the local officials who held the customs offices at the ports. In 1343 Edward admitted the failure of this search when he farmed the customs revenue to a company of English merchants and thus handed over to them the problem of collecting all that was owed.

Within the framework of fourteenth century administrative practices and traditions the search for royal agents who would work personally and loyally in local areas was foredoomed from the start. As holders of these supervisory

posts the government had to appoint either local men or royal clerks and yeomen. Local men were subject to local pressures; royal clerks and yeomen refused to give personal service. A bureaucrat who held a commission to supervise the collection of the customs was a man who regarded the appointment as a source of extra income with no responsibility to render service. The officials who actually performed local services were men of private means, whose affluence was the reason for their appointment and not a result of their service. Local administration was a monopoly of the amateur, the country gentleman and the well-to-do townsman, and opened no roads leading to high places in the central government. English medieval government had a civil service only in the departments of the central government and in the royal household. No tradition existed of selecting men to work in these departments after service in the counties and boroughs. Conversely, no regular officials of the central government were assigned to work in local administrative offices.

The unsuccessful attempt to supervise the customs service revealed this gulf between central and local administration in fourteenth century England. England had no class of administrators and no way to develop such a class whose duties made them equally at home in Westminster or the smallest administrative district. The only alternative for the king when local opposition to a tax became strong to abandoning the tax was to freeze his income from this tax at a fixed level.

420 pages. \$5.25. Mic 56-163

### THEORY AND PRACTICE OF PAPAL MEDIATION AND ARBITRATION IN THE REIGN OF GREGORY IX (1227-1241)

(Publication No. 14,704)

Edwin Charles Hall, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Gaines Post

A study of the canon lawyers of the 13th century, and more especially of the papal registers of the same period, reveals the pope and the Roman curia engaged, either directly or indirectly, in numerous attempts to settle disputes, frequently in the capacity of a disinterested third party. While there is nothing novel in such an observation, there seems to be considerable confusion both in regard to terminology, since "mediation" and "arbitration" are frequently employed as synonyms, as well as in the procedures actually followed. It has been my purpose to study the meaning and importance of the procedures, both to understand arbitration more precisely and to make clear an interesting aspect of the papal government during the reign of a great pope.

The materials at hand for such a study are so extensive that it has been necessary to limit the sources to the pontificate of one pope. The choice of Gregory IX has seemed to be judicious not only because of his importance as a canon lawyer but also for the promulgation during his pontificate of the significant collection of decretals always thereafter associated with his name. It has been possible, moreover, to consult the Vatican registers for that pontificate as well



as the works of a number of contemporary canonists and authors of treatises on diplomatics and the *ars dictandi*.

Out of this arises the possibility of a clear distinction between arbitration and mediation, the legal controls on the two procedures, and the attempts of the pope and curia to secure the permanence of settlements resolved by these means. Thus an arbitration is seen to be always characterized by a *compromissum*, the act by which the disputants agreed to submit the quarrel to an arbiter, which to a considerable extent controlled the procedure followed but within a carefully delineated legal framework. Mediation on the other hand was a much more informal procedure, frequently referred to as being *sine strepitu iudicii* and the settlement described as an *amicabilis compositio*. Both of these procedures were held in high esteem and the popes acted as both arbiters and mediators on occasion.

Besides these instances where resort was made to mediation or arbitration, disputes came to and were settled through the intervention of the curia in a variety of other ways. The most normal procedure consisted in the "impetration" of papal letters issued by the chancery upon the petition of one of the parties and commissioning a judge or judges-delegate to hear and decide the case according to ordinary judicial procedure.

Far more interesting are those cases which came before cardinal auditors at the curia. While ordinary judicial procedure was used, the canonists argued among themselves as to whether the auditors exercised ordinary or delegate jurisdiction in hearing the cases, and the procedure was definitely of a special character since the pope himself frequently made the decision.

In conclusion, then, this study of papal and curial attempts to settle disputes, especially as reflected in the papal registers for Gregory's pontificate, seems to indicate more clearly the true nature of the *potestas* exercised by the popes of the 13th century in practice as juxtaposed to the theories of some of the more extreme canonists. In short one finds few if any extensions of papal authority beyond the normal bounds recognized by all medieval lawyers.

207 pages. \$2.59. Mic 56-164

#### THE INFORMER IN JEWISH LITERATURE (UNTIL THE END OF THE GEONIC PERIOD)

(Publication No. 15,338)

Rabbi Abraham A. Rapaport, D.H.L.  
Yeshiva University, 1953

The informer has always been a very serious threat to the very existence and security of the Jewish community throughout the ages. This dissertation traces the history of this public enemy and his activities from Biblical times until the end of the Geonic era. One chapter is devoted to an etymological discussion of the four names of the informer which are found in Jewish literature. These names are *Masor*, *Akhal Kurtza*, *Diltor* and *Malshin*. Each of these four names has been shown to exist in a specific branch of the literature.

The definition of the informer varies from one era to another until it acquires its full meaning at the end of the Amoraic period. This definition eventually becomes: "A

person who informs against the life or property of a fellow Jew to the non-Jews."

The motives for informing appear to have been the same throughout history, namely, political ambition, vengeance, opposition to religious observance and financial rewards.

In this dissertation the laws of the informer and their development, his status in society, his treatment by the court, and his influence upon the liturgy are discussed.

373 pages. \$4.66. Mic 56-165

#### HISTORY, MODERN

##### THE DEVELOPMENT OF THE MIGRATORY FARM LABOR SYSTEM IN TEXAS: 1900-1954

(Publication No. 15,445)

George Otis Coalson, Ph.D.  
The University of Oklahoma, 1955

Migratory seasonal labor has become an important factor in the agricultural economy of the United States since 1900. In Texas the migration of farm workers is integrally bound up with the cotton harvest and to a lesser extent with the fruit and vegetable crops in South Texas. Approximately 100,000 migrant workers, the majority Texas-Mexicans, find seasonal employment in Texas agriculture.

The demand for seasonal labor resulted from (1) the mechanization of preharvest cotton operations which allowed farmers to plant and cultivate many more acres than they could harvest with the available resident labor force, and (2) the development of the fruit and vegetable industries in South Texas with their high seasonal labor requirements. In response to the increased demand for unskilled labor, thousands of Mexican immigrants entered the country during the first three decades of the twentieth century and settled in South Texas, forming a reservoir of cheap labor from which Texas farmers could draw to meet their seasonal labor needs.

Actually, a few Mexicans were following the cotton crop in various parts of the state as early as the 1870's, but it was not until after 1900 with the development of new cotton regions and the automobile that certain patterns of migration became apparent. During the winter months, workers found employment in South Texas, usually in the fruit and vegetable fields. Each summer they followed the cotton harvest across the state, beginning in the Lower Rio Grande Valley the latter part of June, going up through the Corpus Christi area, the central section of the state, and ending in West Texas. Then, with the close of the cotton harvest in the High Plains in November, the migrants returned to their homes in South Texas to begin the cycle anew.

In addition to intrastate migration, thousands of Texas-Mexicans left the state annually for employment in sugar beets and other crops in the mid-western states.

The economic depression of the 1930's worked a great hardship on the migratory farm laborers of Texas. Although their economic status was low prior to 1930 due to low wages and underemployment, it dropped even further during the depression. To make matters worse, relief



facilities which were available to stationary citizens were closed to the migrant workers who were unable to meet residence requirements. Moreover, attempts made by scattered groups of migrants to improve their lot through unionization were largely ineffective.

During World War II a large portion of the migrant force was drawn into industry and the armed services. Throughout the war years the recruitment and placement of Texas farm labor was directed by the Texas Extension Service, which also conducted an educational campaign to bring about a better understanding between farmers and seasonal workers.

Following the end of the war, Mexican nationals occupied a greater place in Texas agriculture, particularly in South Texas where a majority of the native migrants made their homes. The presence of large numbers of illegal aliens (wetbacks) and contract laborers (braceros) tended to depress wages in the areas in which they were employed, with the result that the seasonal movement of Texas-Mexicans to the northern sugar beet fields was accelerated in the postwar years. 249 pages. \$3.11. Mic 56-166

#### OFFICIAL PROPAGANDA DURING THE REIGN OF HENRY VIII

(Publication No. 15,020)

Julius King, Jr., Ph.D.  
Cornell University, 1955

King Henry VIII, in attempting to obtain an annulment of his marriage with Katherine of Aragon, pursued a policy which led him to repudiate the authority of the pope in England, to have himself declared Supreme Head of the *Ecclesia Anglicana*, and to suppress the English monasteries. In doing these things, he affirmed explicitly and implicitly the supremacy of the temporal power over all subjects, lay and clerical, within its jurisdiction. Since most of the nations of the West operate on this principle today, Henry's success was a significant milestone in Western political development, and the reasons for that success should provide a fruitful subject for investigation.

Historians have tended to follow one of two theories in attempting to explain Henry's success. One theory discounts to a considerable extent the evidence of contemporary opposition to the English king's policies and argues that the English people must have approved of the changes in view of their lasting nature. The other theory argues that the English people indeed opposed the changes, but that the king terrorized them into acquiescence. Neither of these two theories has much to say about one aspect of Henry's policy that was operative during the crucial years of change from 1527 to 1540. This was the constant official use of every channel of communication known to the sixteenth century to tell convincingly the king's story to the English people.

In the annulment case, in the repudiation of the pope, in the establishment of royal supremacy and in the suppression of the monasteries, Henry proceeded generally as follows:

1. He would argue by every means at his command that a change was necessary, playing not only upon native anticlericalism, antipapalism, insularity and loyalty

to himself, but by using powerful arguments drawn from history, from law, from Scripture, from reason and from authority.

2. He would then institute the change in a manner always in accord with the letter of English constitutional practice — arbitrarily but legally. At the same time he continued to issue arguments in favor of the change.
3. Once the change had been legally instituted, penalties were enacted against any expression or act of opposition to it, and arguments why the change should be accepted continued to be disseminated.

This method successfully confined opposition to little more than muttering until the suppression of the monasteries. Uprisings occurred in the North as a direct result of the suppressions, but they were broken up quickly and almost bloodlessly, since Henry not only played upon the distrust between the commoners among the rebels and their upper-class leaders, but because he could also prove to them that he had done nothing illegal.

His arguments did not necessarily convince his people that he was right. All he had to do was to show them that he might possibly have some justice on his side. With his people uncertain that he was absolutely wrong, Henry could feel reasonably certain that most of them would not oppose him to the death. He was able to make them uncertain because of their theological insufficiency and because the arguments they heard in opposition to his position were extremely inept and unconvincing. Once the changes had been made, the arguments Henry had put forth were sufficient for the English to rationalize their acceptance of the new state of affairs and to lose interest in working actively to bring back the old one.

262 pages. \$3.28. Mic 56-167

#### THE ADOPTION OF INOCULATION FOR SMALLPOX IN ENGLAND AND FRANCE

(Publication No. 15,418)

Genevieve Miller, Ph.D.  
Cornell University, 1955

Data concerning the genesis of modern immunology, smallpox inoculation, have never been sought extensively in non-medical sources or correlated with the scientific movement of the early 18th century. The present study, through an intensive reexamination of the medical sources and a generous sampling of miscellaneous contemporary documents such as the records of the Royal Society and the College of Physicians of London, personal correspondence, memoirs, newspapers, periodicals, and general scientific literature, analyzes the circumstances which led to the permanent adoption of the practice in England in the 1720's and in France a generation later.

Several basic revisions have resulted. The important role commonly assigned to Lady Mary Wortley Montagu in the introduction of inoculation to England has been reassessed, and more credit is given to Sir Hans Sloane and his colleagues at the court of George I, who were all members of the Royal Society, actively engaged in the acquisition of useful knowledge. The assertion that inoculation was



abandoned in England after 1728 and revived fifteen years later through the efforts of Dr. James Kirkpatrick has been controverted. More facts have been uncovered concerning the unsuccessful attempt to introduce inoculation into France in 1723 and reasons for its rejection made more explicit. Evidence has been produced to correct the misconception that organized religion was opposed to the practice.

In the sphere of medical thought, experience with small-pox inoculation clarified ideas concerning the etiology of the disease, by furnishing specific proof that it originated with a material substance introduced into the body from outside. This knowledge stimulated efforts to control the disease by means of isolation and quarantine, rather than by the deliberate insertion of the virus.

The study brings into relief the significant forces which made an empirical medical innovation like smallpox inoculation acceptable to European society: the growing threat and intensive fear of smallpox, particularly among the upper classes, which made people receptive to a new method of controlling it; a strong program led by members of respected scientific groups, the Royal Society in London and the Academie Royale des Sciences in Paris; the interest and participation of the royal families of the two countries, who provided an example for their subjects; and the increasing concern of business and government interests for the preservation of the productive populace.

A comparison of the agents responsible for the relatively rapid reception and adoption of inoculation in England and those who propagandized for it a generation later in France shows that the new practice, believed to be the greatest medical contribution of the age, was the medical counterpart of Newtonianism, an intrinsic part of "enlightened" thought, promulgated in England and abroad by scientists or literary figures oriented towards the new English philosophy.

378 pages. \$4.73. Mic 56-168

THE LIFE AND THE WRITINGS OF  
DIMITRIE CANTEMIR (1673-1723),  
PRINCE OF MOLDAVIA

(Publication No. 15,380)

Jean Ware Nelson, Ph.D.  
Stanford University, 1955

Dimitrie Cantemir had a two-fold influence in Eastern Europe: first was his political effect as ruler of Moldavia; second, and more important, was his intellectual and cultural influence through his writings. Because his father was Hospodar of Moldavia, the Turks compelled Dimitrie to live in Constantinople, first as a hostage, then as an exile. While there, he received an excellent education and gathered most of the material on which he based his subsequent works.

As a result of the outbreak of the Russo-Turkish war, in 1710, Dimitrie was appointed Hospodar of Moldavia. He deserted the Turks, joined the Russians, and together they suffered an overwhelming defeat. Forced to flee from the Turks, Dimitrie retired to Russia where Peter the Great made him a Prince of the highest possible rank, with wealth and privileges.

Although he had written books previously, Cantemir wrote his most important works in Russia. First was The

History of the Growth and Decay of the Othman Empire, the only one of Cantemir's books translated into English. This valuable work served as a standard text on Turkey for over a century. Cantemir's next major contribution was the Descriptio Moldaviae. Organized in three sections — geographical, political, intellectual — the Descriptio is a thorough, scholarly account of almost every phase of life in Moldavia. It is a treasure on conditions in Moldavia at the beginning of the eighteenth century. The most influential of Cantemir's books was his Hronicul Vechimei a Romano-Moldo-Vlahilor. Its main theses are: the Rumanian people are a homogeneous group and include those of Walachia, Moldavia, and Transylvania; the Rumanians are somewhat backward because their energies have been expended protecting Europe from the barbarian Tatars and Turks. The first two theses have been of great influence in molding the present state of Greater Rumania, and are still vital in Rumanian thought.

Cantemir wrote many more books, but none equals the Ottoman History, the Descriptio, and Hronicul for value of content or influence. Finally abandoning all hope of returning as Hospodar of a free Moldavia, Cantemir ceased to write or to interest himself in his native land. Instead, he took his position as one of Russia's highest ranking nobles; he became an intimate of the Tsar's, a Privy Councilor, and a member of the Senate. On the Persian campaign, 1722, Cantemir became ill and returned to Russia where he died in 1723.

Although Cantemir spent most of his life in Turkey and Russia, his influence on those countries was negligible; his influence on his native land where he spent so little time was of great importance. His influence is especially remarkable as most of his books were published posthumously.

An extremely well educated and talented Prince, Dimitrie Cantemir had some political influence on his country as its ruler. His real contribution though — both political and cultural — is through his books. Dimitrie Cantemir's greatest limitation was the fact that he was a Moldavian. Had he and his works been known to his contemporaries of Western Europe he would have been regarded as one of the outstanding men of his century.

311 pages. \$3.89. Mic 56-169

THE SLAVE TRADE IN FRENCH  
DIPLOMACY, 1814-1865

(Publication No. 13,422)

Martha Settle Putney, Ph.D.  
University of Pennsylvania, 1955

Supervisor: L. M. Case

At the beginning of the period 1814-1865 France was a defeated nation, helpless before the victorious allies. But because Louis XVIII emerged from the rear-guard of the allied armies and because he found support in the slave trading operations of Spain and Portugal, he retained a bargaining position on the slave-trade-suppression issue. The problem thenceforth resolved itself into a diplomatic campaign first to get France to outlaw the slave commerce and then to suppress the traffic on the part of her subjects, under her flag, and in the areas under her jurisdiction.



Great Britain led the assault and at times received able assistance from Austria, Prussia, Russia, and the United States. On other occasions these latter four powers confounded the British offensive.

The Napoleonic decree issued during the Hundred Days was the lever used to force abolition of the trade on the unwilling French people and government. Consequently suppression was associated in the French public mind with ideas of foreign interests. The constant representations, remonstrances, and suggestions reinforced these ideas. The suppression movement in France, therefore, became inextricably bound up with national honor and prestige, national and colonial prosperity, and freedom of the seas with the result that France rejected proposed international plans for the assimilation of the traffic to piracy, for the creation of a naval league to deal with the traders, and for boycotting of the colonial goods of those powers still retaining the commerce. Yet the rising tide of public opinion inside and outside of France compelled the government to take some action to implement its laws against the traffic under the French flag.

The Orleanist regime, confronted with the Belgian crisis and the enmity of the eastern powers, reversed the policy of its predecessor and conceded the right of visit in 1831. The Near Eastern crisis and the subsequent four-power convention of July 15, 1840 which isolated and humiliated France created such an aroused anti-British public sentiment within France that ratification of the Quintuple treated became impossible. Continued press and legislative attacks on the still operative Anglo-French right-of-visit conventions of 1831 and 1833 and the government forced the ministry to seek other modes to suppress the trade.

The cunningly devised *engagé* scheme was pressed into service during the period of the Second Empire to fill the labor needs of the French colonial possessions. It was attacked vigorously by Great Britain, criticized by the United States, resisted by Liberia, and contested by Portugal. Hence, the French imperial government reopened negotiations with England for the use of coolie labor from British controlled India with a view towards the total abandonment of this African laborer emigration project.

319 pages. \$3.99. Mic 56-170

**THE ALLEGED "UN-AMERICANISM"  
OF THE CHURCH AS A FACTOR IN  
ANTI-CATHOLICISM IN THE UNITED  
STATES, 1860-1914**

(Publication No. 13,793)

Charles Louis Sewrey, Ph.D.  
University of Minnesota, 1955

This study deals with the relationship between anti-Catholicism in the United States and the belief that the Church was a threat to American institutions. The sources used include a variety of Catholic and non-Catholic publications, ranging from popular periodicals and tracts to scholarly journals for the clergy.

The conclusion reached in this investigation is that anti-Catholicism was based partly upon genuine ideological differences between the traditional Catholic position and the

typical American viewpoint. This Catholic position was a logical consequence of Catholicism's claim to exclusive religious truth. The present study finds that contemporary attitudes ascribed to the Church played a larger role in affecting American attitudes toward Catholicism than has been indicated by earlier accounts, which have emphasized "inherited antipathies" and national rivalries.

The significance of these contemporary attitudes is suggested by comments appearing in both Catholic and non-Catholic sources. Anti-Catholic writers constantly proclaimed that their basic quarrel with the Roman Catholic organization was not theological and that so long as Catholics recognized the religious and civil rights of others, no serious problems affecting the Church in American society would arise. These writers, however, asserted that the Roman Church was opposed to religious freedom in the American sense, separation of church and state, and the independence of secular affairs from ecclesiastical authority.

Catholic spokesmen recognized that one of their chief problems was convincing the American people that they had nothing to fear from the alleged designs of the Church against the United States Constitution. Practically every issue of the Catholic publications studied dealt in some way with this matter. The leading approach used by Catholic apologists in appealing to American sentiment was to say that the obedience owed by Catholics to the Church was of a purely religious nature and did not affect political loyalties. Efforts were also made to interpret controversial Catholic teachings so as to cause them to seem more consonant with American beliefs.

Some Catholic spokesmen, however, insisted upon a more rigorous interpretation of Catholic theories regarding liberty and the relationship between church and state. These spokesmen admitted that the Church held the American system to be only a temporary expedient pending the realization of something closer to the Catholic ideal. When exponents of this "ultramontane" position were accused of being "un-American", their reply was that loyalty to the Church transcended that to the state and that Catholic doctrine could not be essentially modified to make it more agreeable with the American viewpoint.

Attempts to harmonize the Church's position with American attitudes were not entirely convincing to non-Catholics. They pointed to instances in which these reconciliationist efforts had been contradicted by other and frequently more authoritative Catholic pronouncements. They cited a number of contemporary events, such as the *Syllabus of errors* and the Church's attitude toward political developments in Italy and France, as signifying that Catholicism still held reactionary views on democracy and human freedom. Controversies arising in the United States over education, the political independence of voters and office holders from ecclesiastical authority, and other matters were also used to bolster the anti-Catholic argument. Catholics were further accused of using duplicity and sophistry to conceal weak points in their argument as to the compatibility of Catholicism and American ideals.

Although the same questions continued to rise, American anti-Catholicism became less extreme during the period under consideration. Discrimination against Catholics lessened greatly. This, however, seems to have been due more to a feeling that Catholics in the United States had partially "Americanized" themselves than to a removal of misgivings about the Church's official attitude.

412 pages. \$5.15. Mic 56-171



**AN ACCOUNT OF THE ATTEMPTS  
AT ESTABLISHING A RELIGIOUS  
HEGEMONY IN COLONIAL NORTH  
CAROLINA, 1663-1773**

(Publication No. 15,118)

Alonzo Theodore Stephens, Ph.D.  
University of Pittsburgh, 1955

This work is a critical investigation of the problems which confronted the English Government, the Proprietors, and the Church of England when an attempt was made to establish the Anglican Church in Carolina, 1663-1773. It reveals the opposition and competition of the Quakers, Presbyterians, and Moravians to the Anglican Church.

The material gathered primarily from original sources and church documents has been analyzed within a chapter framework, a framework composed of the major forces and interests, which were impelling the Anglican Church in the direction of constant readjustments.

In 1663, Charles II, King of England, resuming the policy of making England a great colonial power, granted a charter to eight proprietors. The establishment of the Anglican Church was an expressed consideration of the charter. Instructions written into the Charter of 1663 provided for the construction, dedication, and consecration of the Anglican Churches in accordance with the ecclesiastical laws of England.

At the end of 1666 about 800 persons mostly non-Anglicans, were seated on or along the tributaries of the Cape Fear River. The Proprietors, forced to accept many settlers who were not in accord with the Church of England, instructed John Locke to draw up a set of laws for the purpose of bringing the people into obedience. The laws drawn up by Locke became a dead letter by 1680.

An immediate result of this failure was the rise of the Quakers, who found fertile ground for their activities. During the last decade of the seventeenth century the Quakers became prominent in the affairs of the new colony and by 1704 they were able to establish a permanent yearly meeting. Their strength and influence continued in the first half of the eighteenth century and the Anglican Church was forced to give ground and grant costly concessions. The success of the Quakers meant the partial failure of the Anglican Church.

The Presbyterians, another large dissenting group, settling on the coast and then moving inland rose to prominence by 1740. The Presbyterians became prominent as great educators, patriots to the American Cause as well as a great religious force in opposition to the Anglican Church.

The third group, the Moravians, under the direction of Nicholas Lewis Count Zinzendorf and August Gottlieb Spangenberg, settled in the Piedmont in 1753. They, unlike the Quakers and Presbyterians, did not move from the coast to the interior but erected planned settlements which grew outward from a central point. Bethabara, their first settlement was made the temporary training center for the founding of Salem, in 1766, as the permanent headquarters of Moravian activity in the South.

The Anglicans were able to absorb the smaller dissenting groups, such as the Huguenots, but the actions of the Quakers, Presbyterians, and Moravians remained independent. Each of these groups, working in their own way for the right to worship and live as they pleased, together developed into an encirclement movement, which in the end spelled out defeat for the Anglican Church. This opposition aided by internal strife, the domination of the church by the rich, and the lack of foresight by the English bishops went against the Anglican Church in its attempt to establish a hegemony in North Carolina. 299 pages. \$3.74. Mic 56-172

HOME ECONOMICS

**THE BEARING OF THE STUDENT  
TEACHING EXPERIENCE IN HOME  
ECONOMICS UPON ATTITUDES  
TOWARD TEACHING AS A CAREER  
AND TOWARD STUDENTS**

(Publication No. 14,447)

Naomi Gertrude Albanese, Ph.D.  
The Ohio State University, 1955

Student teaching is the culmination of the prospective teacher's preparation and, to be effective, it requires a completely integrative experience. This phase of the teacher education program must be so designed that the prospective teacher grows in ability and willingness to understand youth and to guide learners toward increasingly intelligent participation in a democratic society. This exploratory study was an effort to test two hypotheses: (1) the student teaching experience brings about change in the attitude of student teachers toward teaching as a career and toward the students they will teach; (2) there may be

background factors prior to student teaching and certain experiences during the student teaching period which may be identified with change in attitude. Three aspects of teacher attitude were investigated: namely, enthusiasm for teaching, confidence in ability to work with adolescents, and open mindedness related to acceptance of new ideas and different cultural and socio-economic groups.

Data were secured through means of an interview prior to and following student teaching. The sample consisted of 43 home economics student teachers who comprised the total student teaching population for the fall and winter quarters of 1954 at The Ohio State University.

A chart of characteristic behaviors for the three aspects of teacher attitude studied was developed to classify the students into positive uncertain, or negative groups, depending upon the aspects of teacher attitude they appeared to possess.

The hypotheses were supported, within the limitations of this one study, by the following findings.

Those respondents who showed a positive attitude in the interview prior to student teaching were academically



competent in high school and college and actively participated in school and community activities. This group, which was made up of forty per cent of the respondents had been leaders in various age groups, and had had varied experiences with adolescents.

The data based on the interview following the student teaching experience, indicated that a wide range of activities as a student teacher in the classroom as well as in community functions appeared to be a factor common to the fifty-one per cent of the respondents in the positive group. Co-operative guidance of the supervising teacher was a second factor which seemed to give a positive feeling to those in this group. A limited student teaching experience and lack of adequate assistance from the supervising teacher appeared to be factors common to the twenty-three per cent of the respondents who were in the negative group.

This study supports the belief that an effective teacher education program must be an integrative continuum of educational experiences on campus, interwoven with contacts and teaching responsibilities in schools, homes, and communities of varying types, and culminating in a broad off-campus student teaching experience. Continuous guidance and self-evaluation must be an integral part of the total program if prospective teachers are to see early their potentialities, needs, and capabilities as teachers. Increasingly, more individuals would then be entering the profession with enthusiasm for teaching, confident in ability to work with adolescents, and sensitive to the changing demands of learners and of the society of which they are a part.

294 pages. \$3.68. Mic 56-173

#### HOMEMAKING WORK UNITS FOR NEW YORK STATE HOUSEHOLDS

(Publication No. 15,437)

Kathryn Elizabeth Walker, Ph.D.  
Cornell University, 1955

Time used for the work of homemaking in 250 New York State households was studied for the purpose of developing up-to-date homemaking work units. A homemaking work unit is defined as the average amount of time required to do specified homemaking tasks under average conditions. The work units measure roughly the quantity of work to be done in the home; they do not measure satisfactions nor quality of work. The work unit concept, which has had a long period of use in agriculture, was originally applied to the work of the home in 1938; changes in homemaking practices in the period following the development of the original work units

indicated the need for a revision. Work units were developed for six major areas, representing an average of 78 percent of the total time used in homemaking.

A study was made of the factors which relate to the amount of time used daily for each task, and the factor found by these analyses to have the greatest influence upon the amount of time was used as a basis of the work unit for the task. The factor which was used as the basis of the meal-preparation work unit was the type of meals served; for dishwashing it was the number of persons in the household. Family composition was the basis of the work units for the regular care of the house and for the physical care of family members. The work unit for washing was based upon the number of tubsful of personal clothing and household linens washed, and the unit for ironing was based upon the number of pieces ironed.

Exploratory use was made of the work units with 24 busy homemakers living in Ithaca, New York, and the surrounding area. After the homemakers had kept a one-week record of the time used by all workers in the activities of home-making, an unstructured interview was held with each. The weekly records were also used as the basis for comparing the work load for one week for the 24 households with the work load for one day for the 250 households. As a result of this comparison the work unit for the regular care of the house was changed from a daily to a weekly basis.

The work units were also given exploratory use in meetings with groups of people professionally interested in home management. To these groups the work units were presented as a choice-making tool designed to assist families in making decisions regarding the use of time. They provide an objective basis for decisions regarding the need for changes in methods of work, equipment, or standards; the feasibility of the homemaker working outside the home, on the farm, in a family business, or in community activities; and the desirability of increasing home production or the purchase of additional goods and services.

A study of the attitude of homemakers toward the work of the home indicated that a somewhat greater average amount of time was used for the tasks which they liked best.

An index of accomplishment was computed to compare the average time used in all households to do a home-making task, as measured by the work units, with the time used in each household to do a comparable amount of work. Variations in this index were studied to determine reasons for more work being accomplished in some homes than in others.

The work unit concept can be applied to geographic regions other than New York State, but variations in customs make it desirable for the units to be developed for the particular section in which they are to be used.

244 pages. \$3.05. Mic 56-174



## JOURNALISM

### ANALYSIS OF THE RECOMMENDATIONS FOR THE EDUCATION OF NEWSPAPER PHOTOJOURNALISM STUDENTS, AS MADE BY EDITORS, CHIEF PHOTOGRAPHERS, PHOTOJOURNALISTS, AND PHOTOJOURNALISM INSTRUCTORS

(Publication No. 14,577)

C. William Horrell, Ed. D.  
Indiana University, 1955

Chairman: Carolyn Guss

**Problem:** The principal problem in this study was to collect, analyze, and insofar as possible synthesize current practices and recommendations of those individuals representing organizations and institutions affecting or affected by the undergraduate curriculum in newspaper photojournalism concerning a desirable education program on the undergraduate level for photojournalists.

**Procedure:** Case studies were made of the photojournalistic aspects of seven selected midwestern newspapers. Recommendations for a college curriculum for the education of photojournalism students were made during interviews with editors, chief photographers, and photojournalists on the selected newspapers, and were made by selected photojournalism instructors through a questionnaire.

#### **Findings and Conclusions:**

1. All persons interviewed on the selected newspapers agreed that a college education would be valuable to photojournalists but such an education would not be required for employment within the next five years.

2. Persons in this study recommended the following approximate mean percentages of four years which should be devoted to the four college areas in a photojournalism curriculum: (1) photojournalism, 28 per cent; (2) journalism, 21 per cent; (3) the liberal arts, 44 per cent; and (4) other areas, 7 per cent.

3. Subject matter areas which were considered of most value to students in a photojournalism curriculum were: training in spot news, candid, sports, and color photography; practical newswork on college paper, picture editing, reporting, and news writing; journalism courses; grammar, rhetoric, composition, fine arts, French, college algebra, psychology, physics, government, history, public speaking in the liberal arts and other areas.

4. Recommendations made by persons in this study reflected the training and education which would result in the development of the type of individual presently employed rather than the type of person who would make the greatest contribution to newspaper photojournalism.

**Recommendations:** The recommendations are based upon the data presented in this study and the author's experience in photojournalism. The academic time which should be devoted to the four college areas, as recommended, are general in nature because of the lack of agreement of persons included in this study and other unpredictable and uncontrollable factors.

1. Students should devote 10 to 20 per cent of four years to the study of various types of photography with emphasis on photography as a communications tool.

2. Instructors should emphasize training in the following types of photography: spot news, candid, sports, color, picture story, documentary, pictorial, portraiture, fashion, and advertising illustrative.

3. From 10 to 20 per cent of four years should be devoted to the journalism area.

4. Journalism courses which should be included in a photojournalism curriculum are as follows: practical newswork on college paper, picture editing, reporting, news writing, feature writing, law of the press, photo-engraving, public opinion, and historical development of the press.

5. Students in a photojournalism curriculum should devote from 55 to 80 per cent of four years to the liberal arts and "other areas."

6. Subject areas in the liberal arts and "other areas" which should be included in a photojournalism curriculum are as follows: grammar, rhetoric, composition, and literature; fine arts and applied arts; psychology, physics, chemistry, biology, and geography; government, history, and sociology; public speaking; and radio and television survey courses, philosophy, comparative religions, and health.

7. Institutions which plan to initiate photojournalism programs or re-examine their existing photojournalism curricula should consider these recommendations in the light of their own philosophy, facilities, faculties, organizational structure, and existing general education requirements.

8. Photojournalism instructors should initiate a continuing follow-up study of their graduates who are working in professional photojournalism.

9. There should be more interaction between professional newspaper photojournalistic personnel and photojournalism.

280 pages. \$3.50. Mic 56-175

## LANGUAGE AND LITERATURE

### LANGUAGE AND LITERATURE, GENERAL

#### A CRITICAL EVALUATION OF A SELECTED LIST OF CHILDREN'S LITERATURE

(Publication No. 14,271)

Doris Kerns Eddins, Ed. D.  
Michigan State University, 1955

In this investigation, A Critical Evaluation of a Selected List of Children's Literature, an attempt has been made 1) to determine the components of a global attitude, 2) to illustrate the role played by reading in formulating attitudes, and 3) to ascertain whether or not children's books first copyrighted within the United States in the twenty-six year period preceding 1951 are stories that could be expected to, or not to, contribute to the development of a global attitude.

A review of literature written by scholars of history and international relations has yielded six components of a global attitude. They are: 1) recognition that problems which are global in nature must be solved on a global basis, 2) recognition of the inter-dependence of men, 3) an open mind, ever willing to entertain ideas contrary to popular belief, 4) recognition that all men must be regarded on a fraternal rather than a differential basis, 5) an enlightened mind, seeking for further information as such information is made manifest, and 6) recognition that national rights and duties can be assimilated into something more efficient than anarchic nation-states.

Studies show that reading is sometimes effective in attitude formation. The content of one hundred thirteen children's books has been assessed in order to ascertain whether or not such content could or could not be expected to contribute to the development of a global attitude. The list of books used in this study has been selected according to the following criteria: 1) books copyrighted in the United States from 1925 to 1950 inclusive, 2) books classified in the 1951 edition of *The Children's Catalogue* as fiction suitable for grades four or five, though they may also be suitable for other grades, 3) books which appear under the headings of continents, countries (except the United States), linguistic families or large areas of the earth.

Global problems - war, economic conditions, and natural phenomena - appear in books copyrighted from 1925 to 1950 inclusive. Problems in the books copyrighted from 1925 to 1950 are generally solved through charity, hard work, and religious faith. Intelligent planning and concerted co-operative effort have gained increasing importance in the books copyrighted since 1940.

Interdependence of man appears to a small degree in children's books. On the whole it has been neglected.

There are some stereotypes in children's books. These are regarded as failing to contribute to an open mind.

Books have been screened for social values as a way of determining whether or not peoples are described as of approximately equal worth. In this respect children's literature does very well.

Treatment of the similarities and differences of peoples and of the institutions developed is regarded as making a contribution toward an enlightened mind. In most of these respects children's literature does well. Schools and political institutions are both neglected.

Not one book mentions the place of international organizations in the world.

It would seem, therefore, that development of global attitude through children's literature is accidental at best.

427 pages. \$5.34. Mic 56-176

#### JONATHAN SWIFT'S HOSTILITY TO SCIENCE

(Publication No. 13,341)

Robert Reiley Owens, Ph.D.  
University of Minnesota, 1955

Jonathan Swift's evaluation of science involves two separate and distinct problems: the relationship of science to truth, and the usefulness of science. The problem of science and truth can be reduced to a consideration of the sanctions for moral values, on the one hand, and the truth status of facts about the physical world, on the other. Swift resolved the problem of science and moral sanctions by arguing that moral truth, which is stable, uniform, and absolute, is derived solely from the Scriptures, from the Christian-classical moral traditions, and from moral experience. He considered that the apprehension of moral truth was in no way dependent upon man's knowledge of the physical world. The status of scientific knowledge is a more complex problem, but stated simply it is that the so-called truths of science fall into two fairly distinct categories: speculative knowledge and factual knowledge. Swift rejected the first, which in the eighteenth century were generally in the form of mathematical statements, by means of the empiricist argument that man's knowledge cannot extend beyond the limits of his experience, and that any attempt to extend human understanding beyond those limits by speculative means leads, not to knowledge, but to mere opinion. Speculative science, is therefore, not a body of knowledge, but a pretense of knowledge and an abuse of learning. The status of the facts of science is somewhat higher because those facts can generally be validated empirically and are therefore true in a limited sense; however, bodies of factual truths tend to be unstable, variable, and relative (i.e. conditioned by other facts). For those reasons, the truth status of fact is considerably below the status of moral truth, and, Swift concluded, the facts of science should be evaluated, not in terms of truth, but in terms of utility. Science, he thought, must be the handmaiden of the practical arts; however, the practical achievements of seventeenth and early eighteenth century science had been relatively slight, so that there is merit in Swift's contention that science could not prove its claim of useful service to mankind. The



development of social science and the widespread interest in the possibility of demonstrating moral truths also support Swift's claim that science tended to transgress on the domain of moral truth. Thus, in his hierarchy of values, Swift placed moral truth above all scientific knowledge, like the Renaissance Humanists, he dispoined moral truth from the facts of science absolutely to preserve the autonomy and preëminence of moral truth.

294 pages. \$3.68. Mic 56-177

# LANGUAGE AND LITERATURE, CLASSICAL

## BARBARIANS IN GREEK TRAGEDY

(Publication No. 15,325)

Helen H. Bacon, Ph.D.  
Bryn Mawr College, 1955

The references to foreign peoples and places in the extant plays, and in the fragments, of Aeschylus, Sophocles and Euripides are collected and studied in order to find out how much and in what ways each of the three tragedians makes use of contemporary information about other peoples in representing foreign characters. The following topics are considered - language, physical appearance, costume, objects, religion, customs, manners, geography. From the kind quantity and distribution of references in each writer it is possible to reach the following conclusions.

- (1) Aeschylus uses all available information about speech, behavior etc. in order to represent foreigners as accurately as possible. He does not, however, as is often suggested, introduce foreigners for purely decorative purposes.
- (2) Sophocles, contrary to the usual opinion, in a good many of the lost plays did studies of foreigners based on information as detailed and extensive as that of Aeschylus. He shows a particular interest in stories about Trojans, who are represented with the cultural traits - or what 5th century Greece thought were the cultural traits - of contemporary Persia. The plays showing the greatest interest in foreign material cannot be linked with any certainty to an early "Aeschylean" period.
- (3) Euripides, though he has many foreign characters, is much less interested in accurate representation of them than are Aeschylus and Sophocles. Unlike them he does not differentiate between different nationalities, but creates a generalized atmosphere of foreignness by applying a few stereotyped traits and formulaic phrases to many different types of foreigners. Occasional bits of curious information in the plays and fragments show that this treatment is a matter of intention, not ignorance. On the other hand his plays have an emphasis, rare in Sophocles and almost entirely lacking in Aeschylus, on foreignness as the source of problems and conflict, and on the romantic value of far away peoples and places. In contrast to Aeschylus and Sophocles, whose emphasis is factual and realistic, Euripides' representation of foreigners is symbolic and thematic. 187 pages. \$2.34. Mic 56-178

## THE TRADITION OF THE HELEN LEGEND IN GREEK LITERATURE

(Publication No. 13,695)

Frank John Groten, Jr., Ph.D.  
Princeton University, 1955

The subject of this study is the character of Helen, as it is portrayed in the outstanding works of Greek literature, devoted in whole or in part to her. An attempt has been made to solve problems of meaning and interpretation by analyzing each description of Helen, outlining its implications, and exploring the relation of these results to subsequent delineations. In the light of a perspective so gained the tradition of the Helen legend takes on a significance in Greek literature and thought which would otherwise have gone unnoticed.

The characterizations of Helen have been treated in chronological order, which has permitted the observation of a developing and expanding tradition. Homer presented, on the whole, an unbiased treatment of Helen. The *Iliad* as well as most of the *Odyssey* show her as a helpless pawn of Aphrodite in a war that was undertaken to recover her and to punish Paris, who violated the guest-rights of Menelaus. However, Homer's impartial attitude towards Helen's actions is decidedly not maintained by later authors. Commencing with Hesiod a trend to condemn Helen's behavior as immoral arises, which, in spite of certain defenses made in her behalf, continue to gain momentum, until it reaches its acme in Euripides' characterizations. Hesiod's charges of infidelity were amplified by Stesichorus and thereafter were greatly enlarged by Alcaeus, who was the first to suggest that Helen's actions were detrimental because of the sequence of events they set in motion as well as evil in themselves. The destruction of Troy and of its inhabitants was written down as the outcome of Helen's guilt. Stesichorus' and Alcaeus' accusations were seized upon by Aeschylus, in whose hands was formulated the characterization of Helen which was to prevail with more effect than any other single artistic description of her. The tragic poet by means of the choral odes of the *Agamemnon* linked Helen with the vengeance that descended upon Troy for Paris' crime as well as with the disasters that befell the Greeks in their successful attempt to take Troy. In this role Helen becomes a semi-daemonic figure, an Erinyes, endowed with powers to punish deeds of injustice. She who charmed Paris and the Greeks into acts of *hybris* becomes the instrument of their chastisement.

Future portrayals of Helen closely follow the trail marked by Aeschylus, Herodotus in the first chapters of his history observes how foolish it was to undertake an expedition for the sake of a single woman, and upon this theme Euripides adds his own observations. In his plays we meet with the fullest delineation of Helen, the immoral profligate who was responsible for much destruction. Both aspects of Helen's actions - her licentiousness and its woeful consequences - engross Euripides' interests. With these manifold and varied accusations he connects the events of his own time, namely the Peloponnesian war and Sparta's sponsorship of that war.

Although the attacks upon Helen were both numerous and violent, at least four attempts to defend and praise her were published in ancient times. Stesichorus and Euripides used the artificial device of an eidolon to achieve their purpose of excusing Helen from deserting her husband and participating in the Trojan war, which occurred in spite of her



absence. With this story was linked the legend of Helen in Egypt told by Herodotus, who probably inherited it from Hecataeus and Stesichorus. Some form of this legend may have existed in early times and may have been retold by Hesiod, who commenced the succession of accounts. Both Stesichorus and Euripides seem to have exploited their versions of this legend to contradict their own literary accounts and to satisfy certain elements of public opinion which demanded a sympathetic portrayal of Helen. Two other encomia of Helen, written by Gorgias and Isocrates as rhetorical tracts, dispensed with the eidolon — Egypt story and defended Helen on her own merits. I have postulated that these prose accounts were written to contradict the poetic tradition so hostile to Helen and to prove that she could be eulogized as well as censured. Isocrates in particular took especial pains to point out that the Trojan expedition was not a foolish but a worthy idea which strengthened the manhood and valour of Greece, and which was justified as an undertaking for a beautiful and virtuous woman sprung from the gods and eminently worthy of the efforts expended in her behalf.

268 pages. \$3.35. Mic 56-179

#### THE DRAMATIC USE OF IMAGERY IN AESCHYLUS

(Publication No. 15,326)

Barbara Lenore Hughes, Ph.D.  
Bryn Mawr College, 1955

Action in the Aeschylean dramas is simple. Major events are apt to occur off-stage. Important characters may not appear on stage. Settings are, with one exception, single, and dramatic time, although it has no definite limit, is very much restricted. Despite this concentration in space, in time, in even the cast of characters, there is in all the plays a narrative that is continuous beyond action, a drama that transcends action.

Visionary characters in their remembrance of the past, in their prophecy of the future, in their description of the present's unseen events build a narrative that is continuous beyond action. By a parallel but not entirely separable technique, imagery as it recalls the past, anticipates the future and defines the present situation creates a drama that transcends action.

This imagery, made up of a complex of symbols, derives usually from a real symbol, a symbol provided in "action". So, in the *Persians* the bridge across the Hellespont, in itself a symbol of Xerxes' pride and power, of Persia's wealth and skill, of war and the attempted enslavement of Greece, becomes a "yoke". That "yoke" then comes to stand for all the forces that caused and resulted from the building of the bridge, the real "yoke" across the Hellespont. Finally, other symbols related to the "yoke" either in form or in use (the net, the balance, the conqueror's trampling foot) develop and complete the image pattern.

This dissertation details image patterns of this sort for each of the extant Aeschylean plays. These patterns, it maintains, neither decorate nor illustrate drama. Rather, in a constant recall and anticipation of fact in symbol, they create drama. In this sense imagery is dramatic imagery.

178 pages. \$2.23. Mic 56-180

#### LANGUAGE AND LITERATURE, LINGUISTICS

##### THE LATIN-OLD ENGLISH GLOSSARIES IN PLANTIN-MORETUS MS 32 AND BRITISH MUSEUM MS ADDITIONAL 32,246

(Publication No. 15,375)

Lowell Kindschi, Ph.D.  
Stanford University, 1955

The purposes of the present study are: to present in what is believed to be their original order the glossaries contained in the margins of an eleventh-century manuscript now existing as two fragments, Plantin-Moretus 32 in the Plantin-Moretus Museum in Antwerp and in British Museum MS Additional 32,246; to explain difficult lemmata and glosses whenever possible; to compare these glossaries with a similar seventeenth-century transcript known as Junius MS 71, in order to determine the relationship between the earlier manuscript and the transcript; and to record errors in the printed version of this transcript found in the widely used *Anglo-Saxon and Old English Vocabularies* by Wright-Wülcker.

The reconstruction of the probable foliation of the manuscript before it was divided has been determined by the order of glossary entries in the transcript and by the continuity of the main textual material (*Institutiones Grammaticae* of Priscian), along the margins of which the glossaries were written. Most of the difficult lemmata and glosses are explained by an examination of probable source passages in the *Etymologies* of Isidor of Seville; by reference to the work of glossary scholars and lexicographers; by comparison with similar entries in other Old English glossaries and in Old High German glossaries; and by analysis of scribal errors. The comparison of the eleventh-century glossaries with the Junius transcript includes a consideration of alterations, misreadings, spelling, and abbreviations in the transcript and marginal marks and marginal groupings in the earlier manuscript.

As a result of these procedures, the glossaries contained in the Antwerp and British Museum fragments are presented for the first time in their original continuity, accompanied by explanatory notes, and the suggestion is advanced that the glossaries served as the immediate source of the Junius transcript. Since the transcript, and more particularly the sometimes unreliable version of it printed by Wright-Wülcker, has served as an important source of glossarial information for lexicographers, it is noted that a number of entries in Old English dictionaries are incorrect, representing words which exist only in the erroneous form recorded in the transcript or its printed version.

293 pages. \$3.66. Mic 56-181



A LINGUISTIC STUDY OF THE BOOK  
OF MATTHEW IN MANUSCRIPT I.I.6  
OF THE ESCORIAL LIBRARY

(Publication No. 14,774)

Thomas Andrew Montgomery, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Lloyd A. Kasten

Manuscript I.I.6 has long been considered one of the most valuable medieval Spanish Biblical texts known, but to date it has gone unpublished except for a few fragments. This is mainly because it contains only the second half of the Bible, from Proverbs on, and editors have preferred versions that would permit them to start with Genesis. Américo Castro announced his intention to use I.I.6 in his *Biblia medieval romanceada*, but this project was abandoned after the first volume, containing the Pentateuch, was printed from Escorial manuscripts I.I.3 and I.I.8. Cornu published the Song of Solomon from it, and expected to continue with the four Gospels, but these never appeared.

The special importance of this document lies in its age and the care with which it was prepared. Its language is somewhat older than that of the great historical works of Alfonso X, so that its general resemblance to these works would place it in the early years of his reign, before 1270; the other extant Spanish Bibles date from the fourteenth century or later. The unusual correctness of its transcription has been noted by several scholars; Menéndez Pidal refers to it as one of the finest medieval Spanish manuscripts. Its version of the Vulgate is usually accurate and possesses considerable literary merit.

This study reproduces the book of Matthew, with a prologue, from the manuscript, and undertakes to set forth in detail the linguistic information found there. The material is given under the usual categories: phonology, morphology, syntax, vocabulary. The phonological discussion is limited to items of special interest in the text, but the other treatments are meant to be thorough. Special attention has been given to the syntax, and the text has yielded a larger body of significant information in this field than in the others. To illustrate the type of material gathered, a few items will be summarized here:

The definite article is used with the possessive adjective 93 times; it is omitted 383 times. The main factor in its use is that of emphasis or solemnity, so that it is most frequent with the subject of a sentence, with the first and second person adjectives, with something spoken of for the first time, and in citations from the prophets.

The accusative *a* always appears before proper names; elsewhere it is not common. It is sometimes used to distinguish subject from object, in expressions parallel to others where *a* is required, and in cases of confusion with the dative.

There are ten cases of compound perfect tenses with the auxiliary *auer*. All but one are with transitive verbs; all are preterit perfects except for one pluperfect. There are 64 such cases with *seer*, in a wide range of tenses, with intransitive, passive, and reflexive verbs.

The subject of a sentence never precedes its verb except in certain restricted circumstances: with an object after the verb, a compound subject or verb, and in a few almost fixed expressions; the total number of cases where the subject precedes is very small.

351 pages. \$4.39. Mic 56-182

LANGUAGE AND LITERATURE,  
MODERN

THEMES OF TERROR IN NINETEENTH  
CENTURY ENGLISH FICTION: THE  
SHIFT TO THE INTERNAL

(Publication No. 13,160)

Donald Whitelaw Baker, Ph.D.  
Brown University, 1955

The thesis attempts to demonstrate in nineteenth-century English terror-fiction a shift from external, sensory themes and devices to internal, psychological themes and devices. At the same time it investigates a number of related sources of the materials of terror-fiction.

Chapter I:

Terror-fiction from Walpole to Maturin was based on eighteenth-century sensory associationism in psychology, and achieved its effects by means outside the minds of its characters. But it often dealt with the phenomena of psychopathology and, very rarely, with such internal phenomena as dreams, though it never adopted an internal, subjective point of view.

Chapter II:

The influence of Gothicism extended through most of the nineteenth-century and is particularly discernible in the works of Scott, Bulwer-Lytton, and Brontë sisters, Dickens, Collins, and Le Fanu.

Chapter III:

The occult science employed as material by Gothic writers like Godwin and Shelley was succeeded in the nineteenth century by the physical science of writers such as H. G. Wells. Naturalistic fiction, dealing with social, economic, and natural forces, the effect of which is often terrifying, appeared, chiefly in the work of Dickens, George Eliot, Gissing, and Hardy. Against the backdrop of modern science and sociology appeared such terror-figures as the "mad scientist" of Mary Shelley, Le Fanu, Collins, Wells, Blackwood and Machen.

Chapter IV:

Anthropology, especially ethnology, stimulated terror-fiction based on materials recorded by such investigators as Tylor and Frazer. Although ethnological materials played an incidental role in such early nineteenth-century fiction as Scott's, they later became a basis of many of the tales of Le Fanu, Stoker, Machen, and Blackwood, among others. The interest of these writers in ethnological materials led them towards treatment of the psychology of myth, legend, and fantasy. When combined with interest in mesmerism, spiritualism, or psychology itself, this treatment became a probing of the mind, a description of its phenomena, normal or abnormal, and an approach to the totally subjective point of view.

Chapter V:

The most important influence on the shift to the internal in terror-fiction was mesmerism. It not only drew attention to psychological and parapsychological phenomena but also directed the course of nineteenth-century psychiatry and contributed to the development of Freudian psychology



and its concept of the unconscious. Its influence before Bulwer-Lytton was slight, but it bulks large in the fiction of Bulwer-Lytton, Charlotte Brontë, Le Fanu, Collins, Henry James, Du Maurier, and others. These writers did not always enter the minds of their characters, but their interest in and knowledge of mesmerism led them to base many of their works on the mental phenomena with which it was associated.

#### Chapter VI:

Modern spiritualism, developing after 1848 and finding fertile ground among those who had already considered a spiritual explanation of the phenomena of mesmerism, was an important source of terror-fiction. It too led to an interest in the phenomena of the mind, the soul, and the "spirit," with a resulting wave of fiction which probed these things. This interest is reflected in the works of Le Fanu, George Eliot, Collins, James, and especially Algernon Blackwood, among others. In addition, spiritualism led to such later cults as that of theosophy, which revived occult science and elevated magic to the level of a religion. Psychic phenomena became common matter in terror-fiction of the late nineteenth-century, and its treatment was often internal, that is, from the subjective point of view. The events of the mind and soul were fundamental to such tales.

#### Chapter VII:

Psychology itself developed stature as a science during the nineteenth century. Most important to terror-fiction was its psychiatric branch, in which mesmerism assisted in the eventual discovery of the unconscious and the means of reaching it. Although terror-fiction from the beginning had employed psychopathological materials, these were treated subjectively only relatively late in the century, by such writers as Bulwer-Lytton, the Brontës, Dickens, Le Fanu, Collins, Wilde, James, Machen, and Blackwood. Sadism, masochism, and outright madness, as well as various neuroses and psychoses, appear either consciously exploited or unconsciously revealed in the works of these authors.

#### Chapter VIII:

Finally, the shift to the internal was completed in the works of those authors who dealt with dreams, delusions, and hallucinations, sometimes externally, often from the subjective point of view, that is, from within their characters. Le Fanu, Bulwer-Lytton, Collins, Du Maurier, Stevenson, Machen, James, and especially Blackwood, among others, produced terror-fiction of the internal. Blackwood completes the transition in the early twentieth century by combining pre-Freudian themes and devices which reach the interior of the mind with twentieth-century psychology of Freud and Jung.

My conclusion is that terror-fiction, during the nineteenth century, evolved through science, sociology, ethnology, mesmerism, spiritualism, and psychology and psychopathology proper, from fiction producing terror through themes and devices outside the human mind to fiction which adopts the mind itself as its setting and psychological and especially psychopathological and parapsychological phenomena as its incidents and episodes.

428 pages. \$5.35. Mic 56-183

### THE EXPRESSION OF THE COMIC IN THE PLAYS OF FERDINAND RAIMUND

(Publication No. 15,364)

Bartel Edward Ebel, Ph.D.  
Stanford University, 1955

Ferdinand Raimund (1791-1836), master of the *Zauberposse*, is called "Oesterreichs grösster Volksdichter," and "der grösste dramatische Künstler dieser Zeit," who portrays "erstaunliche Sicherheit der Bühnenbeherrschung," who creates "lebensvolle Gestalten von überzeugender Wahrheit," and whose name is associated with those of Goethe and Shakespeare.

Such evaluations by recognized literary critics, such as Richard M. Meyer, Josef Nadler, Wilhelm Scherer, and Robert F. Arnold, induced this study of the comedies of Raimund to determine what elements give their author the recognition of being the preeminent dramatist of the Viennese *Volksstück* and particularly of the *Zauberposse*.

In the introduction of this study, the political, economic, and social conditions of Austria in Raimund's days are reviewed, because they form the background of his works. Chapter one traces briefly the history of German comedy on the stage, chapter two treats the development of the Viennese *Volksstück* and touches upon the outstanding writers of this type of plays, and chapter three reviews the life of Ferdinand Raimund and adds a critique of his technique. The remaining chapters are devoted to an investigation of Raimund's dramatic works.

The investigation covers, first of all, the language of these plays, which derive much of their humor from the Lower Austrian and the Swabian dialects, from some thirty varieties of comical figures of speech, from voices and cries of animals, and from crashing sounds of the elements. Then the plots are studied, which are based on assimilation toward the worse, assimilation toward the better, deception, the impossible, the irrelevant, the unexpected, debasement, foolish choices, inconsequent discourse, and clownish actions.

The characters are then examined, which do not only include all the twenty-four humorous types enumerated by Aristotle, but exceed this catalogue by a substantial number. The additional chapters are devoted to a study of Raimund's stagecraft, the songs, the instrumental music, and the dances, and their contribution to the comical effect of Raimund's plays.

The study reveals (1) that Raimund achieves much comedy by letting his humorous characters speak in the Lower Austrian and the Swabian dialects, animated by many curious figures of speech and by ridiculous grammatical errors. (2) He constructs his plots on the turbulent economic, social, and domestic circumstances arising from the disastrous conditions after the Napoleonic wars. (3) One of Raimund's outstanding contributions to the Viennese drama is the creation of a new clown, exemplified by Valentin, who supplanted the coarse *Hanswurst*, ousted from the theater by Emperor Joseph II. (4) Raimund introduces the fairy world into all his plays and makes its characters more natural than any other Viennese playwright. (5) The allegorical figures, such as Youth, Old Age, Envy, the Four Seasons, etc., add further humor to these plays. (6) A psychological truth and (7) a pedagogical lesson are unmistakably present in all these comedies. (8) Some of



Raimund's songs are so truly in the spirit of the *Volksdichtung* that they continue to be sung as an expression of the *Volksseele*. (9) Raimund's optimism is another important factor, that gained for him the favor of the public.

Raimund was a product of his country, of his people, and of the period in which he lived, and he remained true to his tradition and gave back to the people what he had received from them. Richard M. Meyer summarizes this fact in the words, "Alles was er anfasste, adelte er. Das war das Neue, das ein echter Dichter diese alten Gegenstände, wie sein Barometermacher, mit dem Zauberstab in Gold verwandelte." 296 pages. \$3.70. Mic 56-185

LES THEATRES DU CARTEL. LE  
PRECURSEUR; LES ANIMATEURS  
(1913-1939): ETUDE BIBLIOGRAPHIQUE  
ET REPERTOIRE.

(Publication No. 12,362)

France Fauny-Anders, Ph.D.  
Bryn Mawr College, 1954

This dissertation is intended to be the groundwork for a history of the Cartel, the most important movement of the contemporary French theatre.

Between 1913 and 1939, the theatre in France is centered around the names of five producers: Jacques Copeau, the precursor; then Louis Jouvet, Charles Dullin, Gaston Baty and Georges Pitoeff, grouped into the "Cartel des Quatre."

The Cartel movement is responsible for a revival of the French dramatic art, and has given the role of the producer a new significance. Promoted to the rank of "Animateur du théâtre", he impresses upon the theatre which he directs a definite character, revealed in the selection of plays and in the style of their presentation.

Copeau and the Cartel have endowed the French theatre between the two wars with a prestige unknown since the classical period and have strongly influenced the theatre of today.

The dissertation contains:

a) an introduction which is a short history of the movement, from its beginning in 1913, through the formal foundation in 1927, until the end in 1939.

It includes a concise biography of each producer; a summary of the situation of the French theatre before 1913; a survey of attempts to regenerate the theatre before Copeau; a study of varied influences upon the Cartel and a detailed analysis of the esthetical concepts of the five men.

b) a bibliography; arranged chronologically it gives for each producer:

1. a list of all material written by him. (Plays; translations and adaptations; stage directions; essays and articles.)

2. a list of the plays staged by the producer. Specific data are: place of production; date of "Première"; for foreign plays, the translator; occasional commentaries if the production marks some important phase in the evolution of the Cartel movement; role performed by the producer in the play.

3. a list of written material about the producer, with explanatory notes for items of special importance.

The essential sources used for this work are in the Collection Rondel, Bibliothèque de l'Arsenal, Paris, and in the archives of the "Société d'Histoire du Théâtre", Paris.

323 pages. \$4.04. Mic 56-186

THE POETRY OF HILAIRE BELLOC:  
A CRITICAL EVALUATION

(Publication No. 15,366)

Sally Marguerite Furay, Ph.D.  
Stanford University, 1955

The need for a critical evaluation of Hilaire Belloc's poetry is evidenced by the varying nature of the reviews of his collected verse, and by the exaggerated estimates in some quarters of his importance as a poet. This dissertation attempts to evaluate Belloc's poetic achievement: a) by isolating the major themes of his poetry and relating them to the corpus of his ideas in other writings, in order to provide an explanatory background for the poems and to supply material for an understanding of the motive of much of his verse; b) by examining Belloc's poetic theories in order to judge his poetry in the light of these, since any adequate critical judgment of a poet presupposes a knowledge of his theories; c) by relating his poetry briefly to the poetic theory and practice of his own day and of earlier periods; and d) by examining his poems critically, appraising the details of style, and forming a final critical estimate which is a synthesis of the judgments on content and form.

The lack of subtlety of workmanship and profundity of thought in Belloc's poems can be traced to the fact that he was neither deeply philosophical nor careful in thought, and therefore tended to oversimplify, to generalize, to be careless about details, and to overlook contradictions. His hazy thinking about the end of poetry and the nature and function of the poet made him fail to probe the depths and implications of human experience in his poems.

Analysis of Belloc's poetic themes reveals that full understanding of much of his poetry, both serious and light, depends upon a comprehension of his historical, political, economic, and social theories, which form a system. Since the system is superficial those of his poems which judge human experience by it are superficial. This viewpoint is absent from Belloc's better poems, which grow out of his religious views, his love for his wife, his companions, his home county of Sussex, his enjoyments and avocations.

However, Belloc's poetry as a whole manifests a dichotomy which is probably a result of his careless intellectual habits. His verse shows careful attention to traditional form and metre; but this care is belied by repetitions, imprecision of imagery, loose construction, and diffuse description, which tend to weaken the basic structure of his poems. A concomitant dichotomy appears in his poetic theory when he fails to mediate between exaggerating the extent of poetic inspiration and insisting on careful construction and control of emotion. His theoretic emphasis on a strongly marked accentual quality accounts for the mechanical and monotonous rhythm of much of his poetry. Belloc's finest poems are those in which his thought-content, thought-structure, and metrics are in keeping with the outwardly careful form in which he cast most of his verse.



Belloc's present reputation rests upon sincere, versatile, minor lyrics on Sussex, love poems, and drinking songs, as well as upon his humorous and satirical verse. It is inappropriate to call him a great poet, as has been done, on the basis of such work; his lack of both subtlety of workmanship and profundity of thought mark him as a versatile minor poet. 345 pages. \$4.31. Mic 56-187

THE GROTESQUE ELEMENT IN  
POST-ROMANTIC GERMAN PROSE:  
1832-1882

(Publication No. 15,229)

Lee Byron Jennings, Ph.D.  
University of Illinois, 1955

The essence of the grotesque is found to consist in a fusion of the fearsome and ludicrous in a fantastically distorted image (prototype: the gothic gargoyle). The production of such images rests on a primitive, pre-aesthetic mental activity, whereby a current of demonic fear is "disarmed" by its partial conversion into the comic, droll, or insignificant. This approach limits the consideration to concrete images (either "objects" or "situations"); grotesqueness of "style," as such, is ruled out.

The literature dealt with is that of "poetic realism" (and, to a lesser extent, that of the preceding period). Works of Heine, Immermann, Mörike, Ludwig, Stifter, Keller, and Storm are treated in detail, while those of Droste-Hülshoff, Gotthelf, Friedrich Theodor Vischer, Hermann Kurz, Raabe, Freytag, and Scheffel are but briefly discussed.

In the earlier nineteenth century, there is a tendency to portray life itself as a grotesque panorama, a spectacle at once terrible and insignificantly ludicrous (a tendency still represented by Heine). The later period, however, favors a more restricted — but no less important — manifestation of the grotesque.

The outstanding feature of this nineteenth-century literature is the construction of an ordered world in which disruptive, demonic, and chaotic elements have no place; however, these rejected and suppressed elements continually tend to reassert themselves, and they often do so in ludicrous or inconsequential guise while "disarmed" in the form of the grotesque. The examination of the grotesque passages thus provides insight into hidden anxieties and fears, both of the individual authors and of their age: the thought of death, decay, and transiency and of the senselessness of life; the menace of violence, evil, and the passions; and the bugbear of "restlessness" lurking beneath the outward appearance of stability and repose. The "disarming" of these elemental (sometimes intensely personal) fears is often accompanied by the satire or caricature of particular contemporary "evils," and the process reflects also the peculiar nineteenth-century attitude toward the intractable residue of absolute evil and the demonic: a fantastic expansion which at once magnifies the menace and minimizes its immediacy. The presence of a distinct psychological mechanism (a jocose counteracting of the terrible) is especially well attested in the case of Mörike, Keller, Kurz, and Vischer, all of whom show a strong natural attraction to the grotesque.

This manifestation of the grotesque follows certain definite patterns, which form significant and constant "unreal" (but not necessarily "romantic") aspects of this supposedly "realistic" literature. One such pattern is that of the "demon," an inhuman figure of grotesque appearance, often with strong symbolic overtones. These figures frequently act as the agents of decay or chaos and directly embody the "menaces" already referred to; but their sinister attributes are partly concealed beneath their outward appearance of the foolish or contemptible. Their origin from romantic precedents and their adaptation to new purposes are shown in the case of Immermann and Ludwig.

Another recurring pattern is that of the "underworld." This is an obscure, negative, infernal realm underlying the ordered, positive world of middle-class reality; it is the abode of the "demons" and the receptacle for all those disruptive elements excluded from the main sphere of consideration. Its characteristic feature is grotesqueness. Though described in some form by all of the main authors discussed, it is especially prominent in the works of Stifter, Keller, and Storm. Both the scope of the "underworld" and the ominous activity of the "demons" are surprisingly great.

The appearance of the grotesque is favored (especially in the early years of our period) by the growing distrust of all highly imaginative art in the prosaic aftermath of the romantic era. While the need for fantastic art persists, its justification on metaphysical grounds is no longer possible. It gains the reputation of being morbid (demonic) and inane (trivial) — exactly the aspects present in the grotesque. In the absence of a guiding principle and a proper channel of expression, it may actually live up to this reputation and enter the realm of the grotesque.

The presence of these factors can be demonstrated in the works of Immermann, Mörike, and Stifter. In the case of Keller and Storm, who are more distant from the romantic precedent, we rather sense a general dissatisfaction with the prevailing prosaic, realistic medium and a groping for some new symbolic, mythical, or primitively dramatic form of expression.

In all of these respects — and in its social and cultural as well as its purely literary implications — the grotesque is a symptom of dissatisfaction and protest and the herald of new forms. It bears witness to a strong undercurrent of disorder and disruption below the tranquil surface of the nineteenth-century world. Stylistically, the grotesque passages foreshadow the expressionism of the early twentieth century. 500 pages. \$6.25. Mic 56-188

THE FIRST LITERARY PERIODICALS  
OF THE REPUBLIC OF PANAMA

(Publication No. 15,232)

William Wright Kirk, Ph.D.  
University of Illinois, 1955

A perusal of the first literary periodicals of the Republic of Panama reveals that there were two which were relatively important — *El Heraldo del Istmo*, founded in 1904 by Guillermo Andreve (1879-1940), and *Nuevos Ritos*, founded in 1907 by Ricardo Miró (1883-1940), which was really a continuation of *El Heraldo del Istmo* — and two which were



far less important literariamente and relatively insignificant for this study — Los Anales del Ateneo de Panamá, founded in 1908, and first edited by Nicolás Victoria J. (1862-1950), and Variedades, founded in 1909 by Cristóbal L. Segundo (1885- ).

A cursory glance at the history of the literary periodicals of Colombia and Panama indicates that the nineteenth century predecessors of El Heraldo del Istmo were faced with many of the same problems which the latter and its successors confronted — the intellectual indifference and laziness of capable literatos who refused to write articles, the apathy of the readers, acute financial problems, and political interference.

The analysis of the 66 issues of El Heraldo del Istmo and 50 issues of Nuevos Ritos demonstrates that these two periodicals, despite many exasperating difficulties, were able to attain some of their avowed objectives — to provide the opportunity for promising literatos to try their skill in writing, to serve as a medium for the dissemination of the cultural heritage of Panama, and to improve the cultural tone of the Republic.

From the analysis of the poetry in both periodicals one concludes that the Panamanian poets by their emphasis on the careful selection of words and metaphors — the more incomprehensible, the better — and varying their verse-forms in as many and different ways as possible to express their Ideas, their YO, for the most part considered themselves and their revistas as modernistic in character. Their modernista por excelencia, judging by his works and critical comments about him, was, we conclude, Darío Herrera (1870-1914).

In their efforts to avoid todo lo vulgar, in their smugness, in their morbidly pessimistic stories, and in giving free rein to their imaginación fantasiosa y errabunda, the Panamanian cuentistas, like the poets, were emulating the contemporary European writers and Rubén Darío — their avowed Príncipe de la literatura de América.

Just as modernism is the predominant characteristic in the analyses of the poetry and the short story, so the analysis of the book reviews and other literary comment reflect the ideologies peculiar to this literary movement. Very few critics were opposed to modernism, and Guillermo Andreve, a confirmed modernista, and the outstanding Panamanian critic of the period, seized every opportunity to expound or defend what he considered its virtues.

The first distinctive feature of the two periodicals is an undercurrent of strong antipathy toward Colombia, despite the non-political policies of both periodicals. In each instance Colombia is blamed for the retarded state of Panama's culture. Secondly, the liberality of Guillermo Andreve in printing anti-modernistic comment when he was so fervent in his devotion to this movement, is outstanding and commendable. A third distinctive feature of these periodicals is to be found in the occasional manifestation of anti-Yankee sentiment which is more pronounced in Variedades and Nuevos Ritos than in the other periodicals under scrutiny. El Heraldo del Istmo seemed very kindly disposed toward its neighbors to the North.

Finally, the analysis of the four periodicals, particularly of El Heraldo del Istmo and Nuevos Ritos, has yielded as a byproduct my great admiration for their very ambitious, capable, and indefatigable directors, as well as a very humbling respect for the quality of the fruit of their labors.

309 pages. \$3.86. Mic 56-189

## THE POETRY OF JOHN GOULD FLETCHER, A CRITICAL ANALYSIS

(Publication No. 15,471)

William Robert Osborne, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: William J. Griffin

This study attempts to trace the development of Fletcher's poetry from first to last in an effort to illuminate heretofore unobserved aspects of his art and personality. An attempt is made to record the growth and changes that took place in his writing and thinking between about 1910 and 1950. In pursuing this intent, significant poems are discussed and evaluated, and the poet's importance in American literature is estimated.

Fletcher's major importance would seem to lie in his poetic experiments rather than in his perfecting any one technique. His experiments with musical structures in verse, with color and sound, with synesthetic modes of expression, and his attempts to combine these so as to convey an emotion were among his more influential contributions. There is evidence that his poetry affected the development of Amy Lowell, Conrad Aiken, and to a lesser extent, Hart Crane. Certainly Fletcher's poetry experiments, and personality gave much of the tone and color to the verse of his generation.

The suicide of Fletcher in 1950 does not alone constitute the tragedy of his poetic career. His career is tragic also because Fletcher possessed so many of the gifts that usually make for artistic success, and yet he never quite managed to fulfill the promise of his early career. His failure to achieve poetic prominence may be attributed largely to factors connected with his temperament and personality. Throughout most of his mature life he tended to write and think on opposite planes, often at cross purposes with himself. This fact may be related to his numerous mental and physical breakdowns. In Johnswood (New York, 1953) Mrs. Fletcher states that her husband's illness in later years was characterized by a fluctuation between elation and depression.

Related also to his illness, perhaps, were his restlessness and inconstancy. Something in his temperament would not grant him emotional and geographical anchorage, and throughout much of his life he fled from country to country, from region to region, and from one poetic form to another. He could imitate poets as different as Poe and Whitman, Baudelaire and Verhaeren, or Emily Dickinson and T. S. Eliot. At the same time he was writing his rambling, verbose polyphonic prose poems, he was also writing brief, epigrammatic Japanese poems.

Realizing, perhaps, that his mind suffered from cross purposes he could not resolve, he erected a philosophy that regarded God as the author and essence of conflict and conflict as a necessary condition of man's lot. This appears to have been his attempt to achieve balance and harmony within his dualistic nature, one part of which longed for death, and the other part of which longed for life and fame. Of the two opposing desires, the death urge was apparently the stronger and eventually he acceded to that impulse which, according to Mrs. Fletcher, had haunted him his whole life.

The tension that resulted from Fletcher's unresolved conflicts added a certain vitality to many of his poems, and he was often successful in depicting subtle shades of his



despondency. Effective too were those poems in which he imposed his emotions on imaginative landscapes. But he was unable to organize consistently the material of his pain, and many poems were little more than egocentric catalogs of his quarrels with the world. Could he have continued to write poems with the scintillating freshness of his *Irradiations*, with the inventive vigor of his better "symphonies," or with the lofty dignity of many of his death poems, the story of his art and life would have been different. 371 pages. \$4.64. Mic 56-190

**MONTAIGNE'S COMPOSITION: A STUDY  
OF THE STRUCTURE OF THE ESSAYS OF  
THE THIRD BOOK**

(Publication No. 13,718)

Morris Parslow, Ph.D.  
Princeton University, 1954

The study of Montaigne's theory and practice of composition shows that the essays of the Third Book are completely coherent, organically unified works. Their composition is the artistic expression of the order Montaigne aimed to achieve in his life and which he called wisdom. He sought to integrate and enrich his personality through the prudent exercise of judgment, insuring the freedom and authenticity of this faculty by his criticism of false orders. When his criticism convinced him that given man's temporality no absolute, rational order was feasible, he conceived and practiced a wisdom proper to the human condition. This comprehended a discipline limiting his desires to practicable ends, acceptance of appearances in lieu of essences, and full commitment of self to the present. Wisdom implied an attitude from which orderly and optimum action in any circumstances would always be possible.

Montaigne's concept of literary composition evolved as he attempted to resolve the antithesis of freedom and understanding. First he tried merely to note the incidents of his thought in their apparent disorder. Next he sought to represent himself by depicting the flux of his thought. Finally he saw that the act of composing was the creation of an order: the synthesis of freedom and understanding was accomplished in the thing created, were it a book or a personality.

Considered objectively, as an exposition of ideas, each essay of the Third Book has a definite thematic structure. The form is first projected in the total image of a previous meditation on some theme. The matter is then developed in a natural, but not temporal or logical, movement of thought which has two characteristic strophes: analysis, or repeated but irregular returns to various aspects of the theme, and analogy, which explores new relationships suggested by the analysis. The structure of the essay, then, may be conceived of as spherical, with the parts integrated not by incidental association but through their essential, radial relationships with the central theme. For example, "De la Phisionomie" has as its initial image a long-mediated comparison between Montaigne and Socrates. Its axial theme is the ratio of appearance to essence, contrasted in Nature and "science" and developed in a series of critical and dramatic analogies each bearing directly on this theme.

Considered subjectively, that is, as implementing Montaigne's quest for wisdom, the essays can be understood as products of the dialectical process common to their composition and that of life. From an examination of Montaigne's notion of conversation as a mean term between art and life, we can determine the characteristics of the dialectical form of the essays. These are: a theme, which is a vital but opinionative problem, a development consistent with the principle of pertinence already demonstrated in the thematic structure, and a resolution consisting in the affirmation of an attitude or the equilibrating of various attitudes toward the theme with a view to acting. In this dynamic perspective, the essays may be classified as predominantly direct, ironic, or oblique, depending on the resultant attitudes. Such an approach makes possible a re-evaluation of their composition and a conception of the depth, richness, universality, and perfect unity of the most complex essays.

Montaigne proposed to discover and succeeded in creating a form adequate to, and inseparable from, his thought. His compositions are the realization of order and unity out of the infinite, arbitrary elements of human experience.

247 pages. \$3.09. Mic 56-191

**ESSAI BIO-BIBLIOGRAPHIQUE SUR  
CHARLES BAUDELAIRE**

(Publication No. 14,778)

Raymond Paul Poggenburg, Jr., Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor William T. Bandy

The problem of this dissertation was to write a completely objective, chronologically ordered life of Charles Baudelaire in which each statement would be assigned a documentary source.

Basic documents used were letters to and from Baudelaire, comment in the press of his time about him, and periodicals in which he published. An analysis was made of the *Correspondance Générale* in the Conard edition, of published and unpublished documents pertaining to him, and of letters written to him. Information published in secondary sources was located through the use of the *Répertoire des écrits sur Baudelaire* by W. T. Bandy (Madison, 1953, 139 p.). These items were then examined for their content of exactly dated and verifiable material about Baudelaire, his family and his friends. Publication dates of all the poet's works are included in the chronicling of his day by day activities.

The result is a handbook of material on Baudelaire, providing the most complete single source of reliable historical fact about him. It is intended to be used as a reference tool in further research as well as a trustworthy source of biographical and bibliographical data already available. 391 pages. \$4.89. Mic 56-192



A STUDY OF ARTHUR SCHNITZLER  
(WITH SPECIAL CONSIDERATION OF  
THE PROBLEM OF PSYCHOSIS IN  
FLIGHT INTO DARKNESS)

(Publication No. 15,391)

Robert Otto Weiss, Ph.D.  
Stanford University, 1955

In the introductory chapter the critical literature pertaining to Arthur Schnitzler (1862-1931) is examined, and it is shown that his great interest in psychiatry has been missed altogether and that the abundance of depth psychology in his works has received but little attention. Simultaneously it becomes evident that Schnitzler has been stereotyped as an arch-impressionist and as the author of Viennese decadence. The often considerable depth of his work has been overlooked by most critics.

Since no satisfactory biography of Schnitzler exists, the first part of the investigation attempts to co-ordinate such biographical information as could be gathered from multiple sources. Already as a child Schnitzler demonstrated a definite interest in art and psychology. In deference to his father's wishes he became a laryngologist, although he would have preferred to be a psychiatrist. Gradually he reduced his medical activities in favor of his literary work. Abnormal psychology remained of great interest to him, and independently he arrived at a similar concept of depth psychology as Sigmund Freud. While a leading member of the Jung-Wien group of writers Schnitzler attained his first literary success with the Anatol series of one-act plays (1890). Now he was acclaimed as the poet of süsse Mädel and leichtsinnige Melancholiker, but he outgrew that stage of his development and turned to more serious topics. His scrupulous honesty prompted him to represent the truth as he saw it, and thus he incurred the bitter animosity of certain chauvinistic and militaristic elements who considered many of his works offensive. Through the publication of Leutnant Gustl he lost his commission in the army and was subjected to much anti-Semitic

abuse. The history of his Reigen is recounted as representative of the misunderstanding and ill will frequently encountered by the author. Schnitzler's extensive topical range is discussed, and it is also demonstrated that his works show definite evidence of naturalism, romanticism, and expressionism in addition to impressionism. He was a master of synthesis rather than a follower of any one literary school. The author's change of philosophy from moral relativism to the recognition of Free Will and individual responsibility is traced next, and it is shown further that he was neither an atheist nor an agnostic, even though he did not adhere to any organized form of religion. Schnitzler's personality is then discussed as well as its modification by the catastrophe of World War I, the inevitability of old age, his personal tragic experiences, and his essential loneliness. The portrait that emerges shows Arthur Schnitzler as an outstanding literary figure and a great man.

The following part of the investigation presents in tabular form thirty-two cases of psychosis occurring in the author's works, and it appears that in terms of incidence, symptomatology, and etiology modern psychiatric standards may be applied to them. Thus Schnitzler was far ahead of his time not only in the field of depth psychology but also in his clinical concept of psychosis. To substantiate this recognition, the author's novelette Flucht in die Finsternis is examined in detail. The large amount of clinical material extracted from this work is found to agree in all major aspects with modern psychiatric theory.

In contrast to some other modern writers, however, Schnitzler did not present his specialized knowledge in an ostentatious manner. He worked the psychotic figures into his plots so skilfully that the literary balance and the aesthetic form of his writings are never disturbed.

Schnitzler's literary productions, then, represent a most fortunate synthesis of the work of a gifted writer and a medical scientist. 225 pages. \$2.81. Mic 56-193

# MATHEMATICS

## ON THE FOX INVARIANT

(Publication No. 13,671)

Julian E. Brody, Ph.D.  
Princeton University, 1955

Associated with every simple closed polygon  $k$  in a complex  $K$  there is an element  $\Delta$  of the 1-dimensional Betti group ring of  $K-k$ ;  $\Delta$  is known as the Alexander polynomial of  $k$ . Let  $M$  be an orientable triangulable 3-dimensional manifold,  $\gamma$  an element of  $H_1(M)$ ,  $k$  a simple closed curve which represents  $\gamma$  and which is polygonal in some triangulation of  $M$ . Let  $\Delta$  be the Alexander polynomial of  $k$ ,  $T_1(M-k)$  and  $B_1(M-k)$  the torsion subgroup and Betti group of  $H_1(M-k)$ ,  $i: H_1(M-k) \rightarrow H_1(M)$  the injection homomorphism, and  $*$ :  $B_1(M-k) \rightarrow H_1(M)/iT_1(M-k)$  the homomorphism induced by  $i$ . Then we prove

- (i)  $H_1(M-k)$  and  $i$  depend only upon  $\gamma$ ;
- (ii)  $\Delta^*$  depends only upon  $\gamma$ .

We use the invariant  $\Delta^*$  to obtain a topological classification of (I) the 3-dimensional lens spaces and (II) the topological sums of two 3-dimensional lens spaces.

27 pages. \$1.00. Mic 56-194

## HOMOGENEOUS AND QUADRATIC DIFFERENTIAL EQUATIONS

(Publication No. 13,677)

Courtney Stafford Coleman, Ph.D.  
Princeton University, 1955

The trajectories of the system,

$$(A) \quad \begin{aligned} \dot{x} &= P_m \\ \dot{y} &= Q_m \\ \dot{z} &= R_m, \end{aligned}$$

where  $P_m$ ,  $Q_m$ , and  $R_m$  are homogeneous polynomials of degree  $m$  in  $x$ ,  $y$ , and  $z$ , are studied globally as well as near the critical point at the origin. It is shown that the trajectories at infinity practically determine the behavior of all trajectories. (Parts I and II.)

The possible critical points of the system,

$$(B) \quad \begin{aligned} \dot{x} &= P \\ \dot{y} &= Q, \end{aligned}$$

where  $P$  and  $Q$  are quadratic polynomials in  $x$  and  $y$ , are determined, and a global study of the trajectories in certain cases is made. (Part III.)

49 pages. \$1.00. Mic 56-195

## ON THE CLASSIFICATION OF FINITE ELEMENTARY NILPOTENT GROUPS OF CLASS 2

(Publication No. 15,204)

Hans Karl Flesch, Ph.D.  
University of Illinois, 1955

### I. Introduction.

As the title implies, we are concerned with those non-abelian finite groups all of whose elements  $\neq 1$  are of order  $p$  (an odd prime) and whose commutator group is in the center, or, without loss of generality in this case, coincides with the center. In the latter case, we call them EN2-groups for brevity.

One such group on  $k$  independent generators  $g_i$  is the unique master group  $G$  defined by

$$g_i^p = 1 = c_{ij}^p, \quad g_i c_{ij} = c_{ij} g_i, \quad \text{where } c_{ij} = [g_i, g_j].$$

Every other EN2-group with the same  $p$  and  $k$  is a homomorphic image of  $G$  with kernel in the center  $C$  of  $G$ . Denote by  $G(p, k, d)$  the class of factor groups  $G/S$  with  $S$  in  $C$ ,  $S: 1 = p^d$ . Then the problem under study is that of determining the mutually non-isomorphic EN2-groups in  $G(p, k, d)$ , for  $0 \leq d < k(k-1)/2$ . The problem has been solved completely for  $k \leq 4$  and in part ( $d \leq 4, 3$ , respectively) for  $k = 5, 6$  by H. R. Brahana and others by a method employing the language of projective geometry. In this paper a different (matrix) procedure is developed to permit treatment for general  $k$ ; detailed classifications are then given for  $d = 1, 2$ .

### II. Some remarks on the automorphisms of $G$ .

If a given minimal set of generators of  $G$  is arranged in the definite order  $g_1, \dots, g_k$ , every element  $x$  of  $G$  has a unique representation  $x = c_x g_1^{x_1} \dots g_k^{x_k}$ ,  $c_x \in C$ ,  $x_i \in GF(p)$ . The automorphisms  $\alpha$  of  $G$  are obtained by putting  $\alpha g_i = c_{\alpha g_i} g_1^{a_{1i}} \dots g_k^{a_{ki}}$ , with the  $c_{\alpha g_i}$  ranging through  $C$  and  $|a_{ij}| \neq 0$  over  $GF(p)$ . Then

$$\alpha x = c_{\alpha x} g_1^{\sum a_{1i} x_i} \dots g_k^{\sum a_{ki} x_i},$$

with  $c_{\alpha x} \in C$  easily computable in terms of  $c_x$  and the  $c_{\alpha g_i}$ . Denote by  $\bar{x}$  the columnvector with coordinates  $x_1, \dots, x_k$  also, associate with every element

$$s = \prod_{i < j} c_{ij}^{s_{ij}} \text{ in } C$$

the skew-symmetric  $k$  by  $k$  matrix  $\tilde{s} = (s_{ij})$  over  $GF(p)$ , where  $s_{ij} = -s_{ji}$  for  $i \geq j$ . Then the automorphisms  $A$  and  $\alpha_1$  induced by  $\alpha$  on  $G/C$  and  $C$ , respectively, are described by

$$\text{Theorem 1: } \bar{\alpha x} = (a_{ij}) \bar{x} = A \bar{x}, \quad \widetilde{\alpha_1 s} = A \tilde{s} A'.$$



Fundamental for the purpose of our classification problem as formulated in the Introduction is the

**Theorem 2:** Let  $S, T$  be subgroups of  $C$ ; the following three statements are equivalent: (i)  $G/S \cong G/T$ , (ii) There exists an automorphism  $\alpha$  of  $G$  such that  $\alpha S = T$ , (iii) There exists a non-singular  $k$  by  $k$  matrix  $A$  over  $GF(p)$  such that  $A \tilde{S} A' = T$ .

The map  $A \rightarrow \alpha_1$  is a homomorphism of the multiplicative group  $\theta$  of non-singular  $k$  by  $k$  matrices over  $GF(p)$  onto the group  $\theta_1$  of automorphisms of  $C$  induced by automorphisms of  $G$ ; in fact, we have

**Theorem 3:**  $\theta_1 \cong \theta / \{-E\}$ .

### III. The groups of order $p^{k(k+1)/2}$ and $p^{[k(k+1)/2]-1}$ .

We are concerned with  $G(p, k, 0)$  and  $G(p, k, 1)$ . The former consists of  $G$  alone; the groups of the latter are of the form  $G/\{s\}$  with  $s \in C$ , and fall into classes  $C_i$  with  $2i = \text{rank of } \tilde{s} = r(\tilde{s})$ . In fact, if we denote by  $n(s)$  the smallest non-negative integer such that  $s$  is the product of  $n(s)$  commutators of elements of  $G$ , we arrive (after a few lemmas) at

**Theorem 4:**  $n(s) = r(\tilde{s})/2$ .

The conclusions of the Chapter are given in

**Theorem 5:** For  $k \geq 3$  there exist exactly  $[k/2]$  mutually non-isomorphic EN2-groups  $G_i$  in  $G(p, k, 1)$ , each of order  $p^{[k(k+1)/2]-1}$  and with center of order  $p^{[k(k-1)/2]-1}$ ; in  $G_i$  there exist generators  $g_1, \dots, g_k$  such that

$$\prod_{t=1}^i [g_{2t-1}, g_{2t}] = 1,$$

and this relation, together with the generating relations as in  $G$ , determines  $G_i$  completely.  $G(p, 2, 1)$  contains just one group, which is abelian.

### IV. The groups of order $p^{[k(k+1)/2]-2}$ with a maximal abelian subgroup of order $p^{k(k-1)/2}$ .

A lemma is included in this Chapter showing that  $G(p, k, d)$  consists entirely of EN2-groups whenever  $d < k-1$ , and only then. This applies in particular to  $G(p, k, 2)$ , with a subclass of which we are now concerned: it is made up of groups  $G/S$  for which  $S$  is generated by two elements, one of which may be chosen to be  $c = c_{12}$ . From an earlier lemma, we know the subgroup  $\theta_c$  of  $\theta_1$  of automorphisms which transform  $c$  into itself, and hence determine canonical forms (skew matrices) for the second generator of  $S$ . For the groups obtained, the distribution of their elements into the classes  $C_i$  is tabulated, and the structure of the corresponding factor groups with regard to abelian subgroups discussed, with quantitative results collected in

**Theorem 6:** For  $k \geq 4$ , the number of EN2-groups of order  $p^{[k(k+1)/2]-2}$  which possess a maximal abelian (normal) subgroup of (the maximal) order  $p^{k(k-1)/2}$  is  $(3k-6)/2$  if  $k$  is even,  $(3k-7)/2$  if  $k$  is odd. For each such  $k$  there is a unique group among these containing exactly  $p+1$  such maximal abelian subgroups, and a unique group having exactly two; the others possess just one. There are no EN2-groups with the described properties and fewer than four generators.

### V. On the general theory of EN2-groups.

An outline is given for further application of the method of reduction used in Chapter IV; canonical matrix forms are again obtained and the results tabulated, providing in particular an independent verification of all earlier findings for  $d = 2$  as listed in the Introduction. We state in part

**Theorem 7:** For  $k \geq 7$ , the number of mutually non-isomorphic EN2-groups  $G/S$  in  $G(p, k, 2)$  whose  $S$  contains no commutator  $\neq 1$ , but at least one product  $\neq 1$  of two commutators, is  $(11k-50)/2$  if  $k$  is even,  $(11k-55)/2$  if  $k$  is odd; for  $k = 4, 5, 6$ , that number is 1, 2, 8, respectively. There is no group of this type with fewer than four generators.

Some directly applicable results from the literature on invariant factor theory are quoted to complete the case  $G(p, k, 2)$ , and, after a constructive proof for the existence of EN2-groups in  $G(p, k, d)$  for every  $d$  with  $0 \leq d < k(k-1)/2$  and even  $k$ , the paper is concluded with the general

**Theorem 8:** The problem of determining the numbers and types of groups in  $G(p, k, d)$ ,  $0 \leq d < k(k-1)/2$ , is completely equivalent to that of the classification of homogeneous linear  $d$ -parameter families of skew-symmetric  $k$  by  $k$  matrices over  $GF(p)$  relative to congruence (with constant transforming matrix) and non-singular linear parameter transformations. 45 pages. \$1.00. Mic 55-196

### THE HOMOGRAPHIC ASPECT OF THE EULER-KNOPP TRANSFORMATION

(Publication No. 15,093)

Justin Gregory MacCarthy, Ph.D.  
University of Pittsburgh, 1955

It is known that the Euler-Knoppe transformation of a series  $\sum_{n=0}^{\infty} a_n$  into a series  $\sum_{k=0}^{\infty} \alpha_k$  may be induced by subjecting a power series in  $z$ , having the  $a_n$  as coefficients, to the homographic substitution

$$z = \frac{-Rw}{(1-R)w-1}. \quad (1)$$

With the intention of exploring the implications of this homographic property, the following fundamental lemma may be established: Let the homography (1) be given and let  $\rho e^{i\theta}$  be a specific nonzero value of  $R$ . Let  $z_0$  be the center of the  $z$ -plane image of the  $w$ -plane unit circle under

$$z = \frac{-\rho e^{i\theta} w}{(1-\rho e^{i\theta})w-1}.$$

In this sense let coordinates  $\rho, \theta$  be assigned to all points  $z_0$  of the  $z$ -plane. Then this mapping,  $M$ , of the plane of  $R$  upon the plane of  $z$  is a non-homeomorphic mapping of the form:

- (a) a mapping of the  $R$ -plane onto an intermediate  $R'$ -plane by  $R' = \frac{1}{R}$  followed by (b) a projective mapping (in terms of  $R' = u+iy$  and  $z = x+iy$ )  $x = \frac{u-1}{2u-1}$ ,  $y = \frac{-v}{2u-1}$ .

Under this mapping  $M$  the circles  $\rho = \text{const.}$  of the  $R$ -plane map into a family of semi-confocal conics,  $\rho = \text{const.}$ , in the  $z$ -plane. The same family of conics may also be defined geometrically as the images of a fixed circle  $|z-1| = 1$  under the homology determined by —

axis of homology: real part of  $z = \frac{\rho+1}{2}$   
 center of homology:  $z = 1$   
 image of  $z = 2$ :  $z = \frac{\rho-1}{\rho-2}$ . (End of lemma)

From this lemma the following theorems may be inferred:

Theorem 1. Let  $\sum_{n=0}^{\infty} a_n$  be a given series of complex terms and let  $\sum_{n=0}^{\infty} a_n z^n$  be the associated power series (i.e., having the  $a_n$  as coefficients). Let  $f(z) = \sum_{n=0}^{\infty} a_n z^n$  have a unique singularity in the compact complex  $z$ -plane at  $z = z_0 \neq 1$ . If  $\sum_{n=0}^{\infty} a_n z^n$  does not have a positive radius of convergence, adopt the convention that  $z = 0$ . Then  $\sum_{n=0}^{\infty} a_n$  is Euler-Knopp summable (in the sense that if

$$\alpha_k = \sum_{n=0}^{n=k} a_n \binom{k}{n} R^{n+1} (1-R)^{k-n} \text{ then } \sum_{k=0}^{\infty} \alpha_k$$

converges) for all  $R$  in the  $R$ -plane open disc  $K_0$  which is bounded by the circle centered at  $R = \frac{z_0}{z_0-1}$  and passing through the origin. Also,  $\sum_{n=0}^{\infty} a_n$  is nonsummable for any  $R$  in the  $R$ -plane exterior to the closed disc  $\bar{K}_0$ . And finally if  $f(z) = \sum_{n=0}^{\infty} a_n z^n$  has several singularities  $z_0, z_1, z_2, \dots, z_i$  in the compact complex plane then  $\sum_{n=0}^{\infty} a_n$  is Euler-Knopp summable for all  $R$  in the intersection of the corresponding open discs  $K_i$  and, if this intersection be denoted by  $G$ , the series is nonsummable for any  $R$  in the complement of the closure of  $G$ .

Theorem 2. Let  $\sum_{n=0}^{\infty} a_n$  be a given series of complex terms and suppose  $\sum_{n=0}^{\infty} a_n$  is summable E-K to the order  $R$  with  $R = \rho e^{i\phi}$  satisfying the inequality  $|R-1| > 1$  ( $< 1$ ). Then  $f(z) = \sum_{n=0}^{\infty} a_n z^n$  is regular throughout the exterior (interior) of the circle centered on  $(\frac{1}{|\rho-2 \cos \phi|}) e^{i\phi}$  and passing through the point 1 in the  $z$ -plane. If  $\sum_{n=0}^{\infty} a_n$  is summable E-K to the order  $R$  with  $|R-1| = 1$  then  $f(z)$  is regular throughout the half-plane  $\phi - 270^\circ < \theta < \phi - 90^\circ$ .

Definition (a). By the convex kernel of a plane Euclidean set  $S$  shall be meant the covering  $H = E \cup P$  of  $S$ , where  $E$  is the union of all closed segments joining points of  $S$ , and  $P$  is the union of all segments joining points of  $E$ .

Definition (b). Let  $a \neq 1$  and  $b \neq 1$  be two points in the  $z$ -plane. Let the circle defined by  $a, b$ , and  $z = 1$  be drawn. Then the arc-segment joining  $a$  and  $b$ , but not containing  $z = 1$ , shall be called the circular segment  $ab$ .

Definition (c). The circular kernel of a set  $S$  in the  $z$ -plane shall mean the convex kernel of definition (a) "segment" read as "circular segment."

Definition (d). If  $\sum_{n=0}^{\infty} a_n z^n$  does not have a positive radius

of convergence it will be said to have a singularity at the origin. If  $\sum_{n=0}^{\infty} a_n z^n$  does not have a singularity at  $z = 1$  then the series  $\sum_{n=0}^{\infty} a_n$  will be called "proper."

Theorem 3. Let  $\sum_{n=0}^{\infty} a_n$  be a given proper series of complex terms. Then there exists an  $R$  such that  $\sum_{n=0}^{\infty} a_n$  is summable E-K to the order  $R$  if and only if the origin of the  $z$ -plane is not contained in the circular kernel of the singularities of  $\sum_{n=0}^{\infty} a_n z^n$ .

60 pages. \$1.00. Mic 56-197

# THE INDEPENDENCE OF THE AXIOM OF CHOICE

(Publication No. 15,027)

Elliott Mendelson, Ph.D.  
 Cornell University, 1955

This thesis shows that the axiom of choice and generalized continuum hypothesis are not provable from the axioms of set theory, if these axioms are consistent. The system of axiomatic set theory for which the proofs of independence (non-provability) are to be carried out consists of axioms A, B, C of Gödel's monograph The Consistency of the Continuum Hypothesis, plus a denumerable set  $\{D_j\}$  of consequences of Gödel's axiom D.

Axiom  $D_j$ :  $\sim (Ex_1, \dots, x_j)(x_1 \in x_2 \in \dots \in x_j \in x_1)$

It follows by the model constructed in Gödel's monograph that, if A, B, C are consistent, so are A, B, C and the  $D_j$ .

The axiom of choice  $H_4$ , in its general multiplicative form, states that, for every set  $x$  of disjoint non-empty sets, there is a set  $y$  which has exactly one element in common with each element of  $x$ . We shall show the independence of the following weak axiom of choice.

Axiom  $H_1$ : For every denumerable set  $x$  of disjoint, two-element sets, there is a set  $y$  which contains exactly one element in common with each element of  $x$ .

Since  $H_4$  implies  $H_1$ , the independence of  $H_1$  will imply that of  $H_4$ . Sierpinski and Specker have shown that the generalized continuum hypothesis implies  $H_4$ . Hence the independence of  $H_1$  will imply that of the generalized continuum hypothesis.

In Part II, it is shown that, if axioms A, B, C, and the  $D_j$  are consistent, then so are A, B, C, the  $D_j$ , and the following axiom:

Axiom Q: There is a 1-1 sequence  $f$  such that every element  $g$  of the range of  $f$  is a 1-1 sequence with the property that, for each integer  $i$  in  $\omega$ ,  $g(i)$  is the unit class of  $g(i+1)$ , and any two elements of  $f$  have disjoint ranges.

The proof of consistency is based upon a model which is essentially due to Bernays (Journal of Symbolic Logic, 1954, pp. 83-84).

Part III contains the proof of the independence of  $H_1$ .



Assuming the consistency of A, B, C, we may conclude, by Part II, that A, B, C, the  $D_j$ , and Q are consistent. Choose a sequence  $f$  given by axiom Q. Let  $\Delta_i$  denote the range of the  $i^{\text{th}}$  element of the range of  $f$ ; let  $\mu_j = \{\Delta_{2j}, \Delta_{2j+1}\}$ , and  $b =$  the sum of the  $\Delta_i$ 's. There is a function  $\pi$  defined on the ordinals such that  $\pi'0=b$ ,  $\pi'\alpha+1=P(\pi'\alpha)$ , and for  $\beta \in K_{II}$ ,  $\pi'\beta=S(\pi''\beta)$ , where "P" and "S" are the power set and sum set operators respectively, and the remaining symbols are defined as in Gödel's monograph. Let  $V_c = S(\pi''0n)$ , and  $c =$  the set consisting of  $\mu_j$ 's. For each  $j \in \omega$ , let  $\delta'j$  be the permutation of  $\Delta_{2j} \cup \Delta_{2j+1}$  which permutes  $\Delta_{2j}$  and  $\Delta_{2j+1}$  and preserves the sequential order within  $\Delta_{2j}$  and  $\Delta_{2j+1}$ . Let  $K = \delta''\omega$ . Then  $\rho \in K$  can be extended to a permutation  $\bar{\rho}$  of  $V_c$  in such a way that, for any  $x \in V_c$ ,

$$\bar{\rho}(x) = \{\bar{\rho}(u) \mid u \in x\}.$$

Let  $\Sigma$  be the class of all  $x \in V_c$  for which there is a finite set  $u$  of integers such that, if  $i \in \omega - u$ , then  $\delta'i(x) = x$ . Define  $\Phi$  on the ordinals by  $\Phi'0=b$ ,  $\Phi'\alpha+1=P(\Phi'\alpha) \cap \Sigma$ , and for  $\beta \in K_{II}$ ,  $\Phi'\beta=S(\Phi''\beta)$ . Let  $F=S(\Phi''0n)$ . Define a model by:

" $M_m(x)$ " for " $x \in F$ "

" $\text{Cls}_m(X)$ " for " $X \subseteq F \cdot (y)(y \in F \rightarrow y \cap X \in F)$ "

" $X \in_m Y$ " for " $X \in F \cdot \text{Cls}_m(Y) \cdot X \in Y$ ".

Then it is shown in Part III that this model satisfies A, B, C, and the  $D_j$ , but that  $c$  is a set for which  $H_1$  fails. Hence,  $H_1$  is not provable from A, B, C, and the  $D_j$ .

42 pages. \$1.00. Mic 56-198

## STUDIES IN STATISTICAL ECOLOGY

(Publication No. 14,419)

Joseph Anthony Navarro, Ph.D.  
Purdue University, 1955

Major Professor: J. H. B. Kemperman

A large population of plants is only observed within certain sampling units. From the data thus obtained, one wants to determine: (1). The manner of dispersal of the population; (2). The values of certain parameters, such as density and coverage. In Chapters 1 and 2 it is shown how to estimate these parameters, when the so-called random model holds.

In Chapter 3, we present several alternative models describing the manner in which the plants in a strip might have been generated in the course of time. The most interesting model  $M(D, m_0)$  is, essentially, a cluster model when  $m_0 < 0$ , a repulsion model when  $m_0 > 0$  and the random model when  $m_0 = \infty$ .

In Chapters 4 and 5, several tests are given of randomness versus specific alternatives, including estimates of the density and the deviation from randomness.

A realistic model of a plant population must include a description of the spatial growth of the population in the course of time. Three such models are developed in the Chapters 6 and 7. Model  $W_1$  requires that each plant will generate exactly one new plant but allows the possibility of death and the presence of an absorbing region (desert). Model  $W_2$  is a special case of  $W_1$  in that it excludes the latter two possibilities. Model  $W_3$  is the most realistic

of the three because it includes the features of dispersal, birth and death, and allows the number of plants produced by a given plant to be a random variable.

124 pages. \$1.55. Mic 56-199

## IDEALS OF NULL SETS OF A TOPOLOGICAL SPACE

(Publication No. 15,098)

John Barr O'Toole, Jr., Ph.D.  
University of Pittsburgh, 1955

It is possible through the introduction of a class of subsets of a given set  $R$  (even if  $R$  has no topological or algebraical structure) to generalize certain notions of set theory and measure theory. If  $R$  is a topological space it is also possible to generalize various concepts of topology. The sets belonging to this class of subsets of  $R$  are called null, negligible, or almost empty. They may be neglected in exactly the same fashion that sets of measure zero are neglected. In order that the negligible sets may have properties intuitively ascribed to almost empty sets, the requirement is laid down that the class of null sets be closed with respect to taking finite unions and that a subset of a null set be null.

Four relations on the class of all subsets of  $R$  are generated by a class of null sets of  $R$ . These relations are called a congruence relation, a quasi-containing relation, a quasi-disjointness relation, and a quasi-connectedness relation; they are generalizations of the equality of subsets of  $R$ , the set theoretic relation  $\subseteq$ , the set theoretic relation of disjointness, and the relation of non-disjointness, respectively. Each of the former relations generates a class of null sets that coincides with the initial class of null sets. This has as a consequence that any of the four relations just mentioned or the concept of null set may be chosen as primitive notion; the other concepts are thereby unambiguously determined. For almost all the theorems in the thesis the concept of null set is chosen as primitive.

A class of null sets of  $R$  generates two equivalence relations on the class of all subsets of  $R$ . A chapter is devoted to the definition of these relations and to a comparison of them with each other.

A class of null sets of  $R$  generates three equivalence relations on the class of all topologies with support  $R$ . These relations are compared with each other.

A chapter is devoted to generalizations of biunique mappings, constant mappings, and onto mappings through the introduction of a class of null sets. These generalizations are based on characterizations of biunique mappings, constant mappings and onto mappings in elementary set theory. An equivalence relation is induced in the class of all mappings having  $R$  as domain of definition.

If  $R$  is assumed to be a topological space, the introduction of a class of null sets of  $R$  permits further generalizations. The concepts of open set, closed set,  $F_\sigma$  set,  $G_\delta$  set, Borel set, closed domain, open domain, boundary set, nowhere dense set, exhaustible set, and continuous mapping are generalized. Each of the generalizations is designated by the name for the concept of which it is a generalization preceded by the word "quasi." If the class of null sets is subject to certain restrictions (called axioms A, B,



C, D) interesting characterizations of the generalizations just mentioned are possible.

The last chapter is devoted to a localization of the notion of null set and of each of the four relations induced by the class of null sets. The class of locally null sets thus obtained is found to comprehend the class of null sets. The further result is obtained that with certain restrictions on the topology of  $R$ , every locally null set is null. This is true, for example, if  $R$  is compact. Two topologies are generated on  $R$  by the original topology on  $R$  and by the class of negligible sets. These topologies are finer than the original topology on  $R$ .

A definition of a generalization of compact space is given in the conclusion; no consequence of this definition however has been elaborated in the thesis. It is conjectured that interesting and fruitful results are obtainable by a study of the consequences of this definition and by a suitable generalization of the topological notion of connectedness.

200 pages. \$2.50. Mic 56-200

# A STUDY OF AFFINITIES AND ANTI-AFFINITIES OF THE PLANE OF TWO COMPLEX VARIABLES AND THEIR REPRESENTATION IN A SPACE OF FOUR DIMENSIONS

(Publication No. 15,099)

Donald Knight Pease, Ph.D.  
University of Pittsburgh, 1955

If  $(X, Y)$  is a point of the affine complex plane,  $C_2$ , and  $X = x + iu$ ,  $Y = y + iv$ , let  $(x, y, u, v)$  be the corresponding point of affine four-space,  $S_4$ . A complex line of  $C_2$  is represented by a regular plane of  $S_4$ . The hyperplane at infinity of  $S_4$  is a projective three-space,  $P_3$ . The regular planes of  $S_4$  intersect  $P_3$  in regular lines. The regular lines of  $P_3$  comprise a linear congruence determined by the regular directrices,  $D_1: x + iu = y + iv = 0$  and  $D_2: x - iu = y - iv = 0$ . To each point of the complex line at infinity of  $C_2$  there corresponds a regular line of  $P_3$ . Any selected real plane of  $P_3$  contains just one point of each regular line with the exception of the one regular line lying in the plane. Since this regular line is equivalent to one point of the complex line at infinity of  $C_2$ , the selected plane of  $P_3$  is topologically equivalent to an Argand plane.

An affinity of  $C_2$  induces a type A affinity on  $S_4$ . The type A affinities are those and only those real affinities of  $S_4$  for which  $D_1$  and  $D_2$  are invariant. An anti-affinity of  $C_2$  induces a type B affinity on  $S_4$ . The type B affinities are those and only those real affinities of  $S_4$  for which  $D_1$  and  $D_2$  are interchanged. The type A and type B affinities comprise the regular affinities, which are those and only those real affinities of  $S_4$  which leave all regular planes regular.

A type A affinity induces collineations on the complex line at infinity of  $C_2$  and on  $P_3$ . If the characteristic roots on the complex line at infinity of  $C_2$  are  $P$  and  $Q$ , the characteristic roots on  $P_3$  are  $P, Q, \bar{P}, \bar{Q}$ .

If  $P \neq Q$  we have the nonparabolic case. If  $P \neq 1, Q \neq 1$  there is a finite fixed point; canonical form  $X = PX', Y = QY'$ . If  $P = 1, Q \neq 1$  we have a screw affinity; canonical form  $X = PX', Y = Y' + F$ . If the characteristic equations are identically zero we have the parallel translation  $X = X' + E, Y = Y' + F$ .

If  $P = Q$  we have the parabolic type A affinity. If  $P \neq 1$  there is a finite fixed point; canonical form  $X = PX' + Y', Y = PY'$ . If  $P = 1$  we have a shear translation; canonical form  $X = X' + Y', Y = Y' + F$ .

A type B affinity induces a collineation of  $P_3$  and an anti-collineation on the complex line at infinity of  $C_2$ . There are two canonical slopes of  $C_2, M_1$  and  $M_2$ , which are fixed or interchanging.

If  $M_1$  and  $M_2$  are fixed we have the hyperbolic case, with canonical forms: fixed point case,  $X = P\bar{X}', Y = QY'$ ; screw affinity,  $X = P\bar{X}', Y = QY' + F$ ; and pseudo-translation,  $X = \bar{X}' + E, Y = Y' + F$ .

If  $M_1$  and  $M_2$  are interchanging we have the elliptic case, with canonical forms: fixed point case,  $X = Q\bar{Y}', Y = P\bar{X}'$  and screw affinity,  $X = (1/\bar{P})\bar{Y}' + E, Y = P\bar{X}' + F$ .

If  $M_1 = M_2$  we have the parabolic case, with canonical forms: fixed point case,  $X = P\bar{X}' + T\bar{Y}', Y = Q\bar{Y}'$ ,  $|P| = |Q|$  and pseudo-translation,  $X = P\bar{X}' + T\bar{Y}', Y = Q\bar{Y}' + F$ ,  $|P| = |Q|$ .

Those regular affinities which are isometries of  $C_2$  (made Euclidean) are found to correspond to rotation, translation, reflection, and glide reflection.

Those regular affinities which are isometries of Euclidean four-space are those for which  $|P| = |Q| = 1$  and  $M_1\bar{M}_2 + 1 = 0$ .

Of the 57 possible types of  $S_4$  affinities, 18 are found to occur as regular affinities. 101 pages. \$1.26. Mic 56-201

# A SELF-ADJOINT BOUNDARY VALUE PROBLEM WITH END CONDITIONS INVOLVING THE CHARACTERISTIC PARAMETER

(Publication No. 15,165)

Frank Brooke Sloss, Ph.D.  
Northwestern University, 1955

This paper is concerned with the two-point boundary problem consisting of the Euler-Lagrange differential equations and transversality conditions for the variational problem of minimizing a quadratic functional

$$I(\eta) = 2Q(\eta) + \int_{x_1}^{x_2} \sum_{\mu=1}^n (-1)^\mu [\eta^{(\mu)}(x)]^2 dx$$

is a class of admissible functions  $\eta(x)$  of class  $D^{(n)}$  on  $x_1 \leq x \leq x_2$  which satisfy

$$\psi_\gamma(\eta) = \sum_{i=0}^{n-1} [\psi_{\gamma_i}^1 \eta^{(i)}(x_1) + \psi_{\gamma_i}^2 \eta^{(i)}(x_2)] = 0, \\ \gamma = 1, \dots, p \leq 2n,$$

and render a fixed value to a given quadratic functional

$$H(\eta) = 2G(\eta) + \int_{x_1}^{x_2} \sum_{\nu=0}^m (-1)^\nu g_\nu(x) [\eta^{(\nu)}(x)]^2 dx,$$

where  $Q$  and  $G$  are quadratic forms in the end values of  $\eta, \eta^1, \dots, \eta^{(n-1)}$  at  $x = x_1$  and  $x = x_2$ . The boundary conditions of this problem involve the characteristic parameter linearly.

With the assumption that  $H(\eta)$  is positive definite on the set of admissible functions  $\eta(x)$  of class  $C^{(n-1)}$  satisfying



$\psi_\gamma(\eta) = 0$ , it is shown that the proper values of the problem here considered are all real, and corresponding proper functions may be chosen real-valued. Variational methods are used in proving the existence of an infinite sequence of proper values, each of which is characterized by a minimum property. Indeed, there is established a general existence theorem which implies in particular the existence and extremizing character of proper values.

Convergence theorems involving the proper functions and proper values are given; these extend the results of Kamke<sup>2</sup> and Schubert,<sup>6</sup> who have treated a similar but somewhat less general problem. The most significant extensions on the results of Kamke and Schubert come with the development of expansion theorems for higher order partial derivatives of the Green's function and convergence theorems for the generalized Fourier Series of a certain class of functions.

A treatment of the end conditions of this problem includes a presentation of necessary and sufficient conditions for the given set of end conditions to be equivalent to another set of end conditions given in canonical form. Also presented are necessary and sufficient conditions for a given set of end conditions to be "Sturmian."

The variational problem of this paper is a special case of a more general problem considered by Reid,<sup>4,5</sup> Hu,<sup>1</sup> and others; in particular, the oscillation and comparison theorems of these two authors and of Morse<sup>3</sup> are applicable to the problem treated here. 48 pages. \$1.00. Mic 56-202

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## ON SOME CONVEX CONES AND ASSOCIATED MONOTONE FUNCTIONS

(Publication No. 15,386)

Donald Platte Squier, Ph.D.  
Stanford University, 1955

A concept of monotone function on a linear space  $S$  is defined in terms of convex cones in the space. In spaces of binary forms in  $x$  and  $y$  of even degree, a characterization of some convex cones invariant under linear transformations on the variables is obtained by the use of some invariants of the forms. In special spaces with special convex cones, functions are defined on the space by means of a scalar function  $f(t)$  defined on an interval together with a generalized concept of eigenvalues. Those functions  $f(t)$  are determined which yield a monotone function on the space. 59 pages. \$1.00. Mic 56-203

## MULTI-DECISION PROBLEMS FOR THE MULTIVARIATE EXPONENTIAL FAMILY

(Publication No. 15,389)

Donald Robert Truax, Ph.D.  
Stanford University, 1955

A study of a class of decision procedures was made when the underlying distribution belongs to the multivariate exponential family. The number of possible actions is assumed finite, and the case of two possible decisions is studied in detail. When the loss functions  $L_1$  and  $L_2$  have the property that the set where  $L_1 - L_2$  changes sign is linear, it has been possible to characterize the Bayes solutions and obtain complete classes of decision procedures. Two main problems of this type are considered and then various extensions of these problems given. The first main problem involves deciding whether or not the unknown parameter point lies on a given  $r$ -dimensional subspace of an  $n$ -dimensional parameter space, and the second problem concerns a decision as to which half space a parameter belongs. Applications of this theory are made to some classical problems of testing composite hypotheses. It is also shown that if the set where  $L_1 - L_2$  changes sign is not the union of parallel linear sets, no nice characterization can be given to the Bayes procedures. Some problems where the number of possible actions is greater than two have been considered, and again complete classes were obtained. The question of admissibility has been studied for some of these problems. It is shown that in the case where the distribution is spherically symmetric, one, can for some special problems, obtain a minimal complete class of invariant procedures. It is also indicated how to extend the results of the finite decision case to the problem of estimating a linear combination of the coordinates of the parameter. 49 pages. \$1.00. Mic 56-204

# LIMITING DISTRIBUTIONS IN SOME OCCUPANCY PROBLEMS

(Publication No. 15,390)

Irving Weiss, Ph.D.  
Stanford University, 1955

Suppose there are  $n$  balls in an urn. There are  $m$  samples taken. Each consists of taking out  $j$  balls at random without replacement. After each sample the  $j$  balls are replaced before the next is drawn. Find the distribution of  $S$  the number of balls that are never drawn in these  $m$  samples of  $j$  balls each.

For the case  $j = 1$ , this is called the classical occupancy case which is treated by Feller when  $ne^{-m/n}$  is fixed as  $n \rightarrow \infty$ . This latter condition implies that the

expected number of balls drawn remains fixed as  $n \rightarrow \infty$ . Feller obtains in this case a limiting Poisson distribution (due to von Mises). We have shown that Feller's argument

can be extended to include the case  $j \neq 1$ , with  $ne^{-\frac{mj}{n}}$  fixed as  $n \rightarrow \infty$ .

However, we are primarily interested in the situation where the expected proportion of balls drawn remains

fixed, corresponding to the condition  $\frac{mj}{n}$  fixed as  $n \rightarrow \infty$ .

This problem (with  $j = 1$ ) has been recently studied by Schafer and by I. N. David, both of whom state without proof that the limiting distribution is normal. A rigorous proof of the normality of the limiting distribution has now been derived for arbitrary  $j$ .

37 pages. \$1.00. Mic 56-205

## MUSIC

# A STUDY OF APPLIED MUSIC IN FOUR-YEAR STATE-SUPPORTED COLLEGES OF TEXAS

(Publication No. 15,462)

John Lee Carrico, Ed.D.  
George Peabody College for Teachers, 1955

Major Professor: C. B. Hunt, Jr.

Two factors influenced the selection of the subject of this study. First, the cogency of the applied music segment of the curricula for music education majors and applied music majors alike was considered valid ground for investigation. Secondly, the diversity and extent of the state-supported system of educational institutions of the state of Texas implied a need for a study which would attempt to focus attention on the status of applied music and its problems in such institutions.

The purpose of this study was threefold: (1) to determine the status of the applied music program in senior state-supported colleges of Texas, (2) to identify significant practices and problems in the administration of the programs of the colleges, and (3) to develop suggestions for improvement in applied music in the colleges.

The descriptive method of research has been employed. The tools of research were the interview and the questionnaire. The data were collected by means of personal visitation to each of the twelve state-supported colleges of Texas which have an organized department of music. A number of investigational techniques were used, including interviews with music department chairmen, consultations with applied music instructors and music organization directors, and observation of classes, rehearsals, and performances. The institutions which comprise the study are East Texas State Teachers College, Lamar State College of Technology, North Texas State College, Sam Houston State Teachers College, Southwest Texas State Teachers College, Stephen F. Austin State College, Sul Ross State College, Texas College of Arts and Industries, Texas State College for Women, Texas Technological College, Texas Western College, and West Texas State College.

The data are presented in group form and with code letter designations for the sake of anonymity in behalf of the music departments.

Applied music, in the context used by this study, includes private and group instruction in music. Ensembles and large musical organizations, although often classified as aspects of applied music, were omitted from the study. The study was organized under four main headings:

1. Offerings and requirements
2. Private applied instruction
3. Class lesson instruction
4. Administrative areas in applied music

Each of the four areas was further divided into sub-areas. These areas and sub-areas were arranged as follows:

1. Offerings and requirements
  - a. Major instrument requirements
  - b. Minor instrument requirements
2. Private applied instruction
  - a. The general student
  - b. The applied music student
  - c. The music education major
  - d. Proficiency standards
  - e. Instructional stresses
  - f. Student performance
3. Class lesson instruction
4. Administrative areas in applied music
  - a. The staff
  - b. Grading in applied music
  - c. Student practice
  - d. Tuition and fees

The study is organized for presentation into four chapters. Chapter I, Introduction, serves to give a brief historical sketch of applied music in colleges and universities, beginning with the medieval university. The development of curricular applied music specifications is also included in this chapter. Chapter II outlines the problem and its purpose, indicates the procedure, and defines the limitations. A resume of related literature is also included. Chapter III presents the data, with an accompanying



interpretation. Chapter IV presents a summary and conclusions, and, in addition, offers recommendations for improvement of applied music programs in the state colleges of Texas. 246 pages. \$3.08. Mic 56-206

# A STUDY OF THE USES OF MUSIC IN SELECTED INSTITUTIONS

(Publication No. 15,132)

Helen Iola Henry, Ph.D.  
Northwestern University, 1955

Fifteen psychiatric hospitals and six schools for the mentally deficient were visited. Data from the Survey of the National Association for Music Therapy questionnaire and two supplementary questionnaires, and personal observations were the bases for the conclusions reached. Because personal visits were made at each of the institutions this study embraces, it was felt that the information gathered by the questionnaires was quite valid. These data were presented in narrative as well as chart form.

No attempt was made to prove the efficacy of music as a therapy. Perusal of pertinent literature, briefly reviewed here, showed no systematic evaluation of actual activities currently practiced. A number of questions were raised, and the answers to them, collected as outlined above, were entered on large tabulation sheets. From these, discriminative summaries were drawn. The interpretation of these summaries led to the following conclusions:

1. Philosophies of music therapy of the individual institutions do not differ significantly.
2. Institutions should take time to formulate philosophies concretely.
3. Institutions do not practice all they profess to believe.
4. General personnel believe music fulfills its function, music workers feel more could be done.
5. An increase of music staff would increase the quality of the extensive programs offered.
6. Activities offered vary slightly.
7. Physical appurtenances and backgrounds of the workers do not influence the therapeutic value of the program greatly.
8. The personality of the therapist is the most important consideration.
9. The status of music indicates that music is not as effective as it might be.
10. Methods and procedures seem to be uniform.
11. No significant relationship between success in music and diagnosis is apparent, but good citizenship in music correlates with liberties granted.
12. Active participation is most beneficial and generally results in behavioral improvement.
13. A patient's work in music increases his interest in things musical.
14. A basic dichotomy was apparent:
  - a. Philosophically the institutions believe in music as a therapy, functionally they consider it a diversion.
  - b. Theoretically the institutions subscribe to basic principles of music therapy, practically they do not take advantage of its possibilities.

## Conclusion

Upon finishing this study, the author was left with one very strong conviction. If institutions would correlate all the music potentials of the entire establishment, the musical results might be increased as much as one hundred per cent. Many ward personnel would be pleased to have an in-training course in how music could serve their wards. Many more personnel in administrative capacities would be glad to have more knowledge of what music might be expected to do. Other activities therapies could use music at least as a background much more than they do. The music therapists could accomplish more with their specialty if they would take time from the day to day duties to evaluate their activities, and they could be of great assistance in coordinating all the latent musical possibilities in the institution.

To close this study of "The Uses of Music in Selected Institutions," the author urges the profession: marshal available forces, incorporate divergent philosophies, combine efforts, coordinate activities, collaborate on commendable results, and cooperate with the whole personnel. Music can become one of the most useful and practical modalities in the therapeutic milieu.

167 pages. \$2.09. Mic 56-207

# THE DOCTORAL DEGREE IN MUSIC IN UNIVERSITIES AND COLLEGES OF THE UNITED STATES

(Publication No. 15,140)

Arthur Ward Kennedy, Ph.D.  
Northwestern University, 1955

Within the broad framework of educating the musician, studies at the doctoral level have become increasingly prevalent in colleges and universities during the past quarter century. The emergence of terminal studies in music is patterned after historical principles and the study of the history and philosophy of higher education, and of graduate school developments in particular, lends parallel significance to the current growth in the area of music.

## The Problem

This study has been undertaken with the assumption that improvement in doctoral programs should be a process guided by principles which have stemmed from a thorough knowledge of existing practices and actions toward establishment and improvement of the degrees. It is an attempt to define the doctoral degrees in music available through colleges and universities of the United States. The study is designed to discover the lines of development from the philosophies and practices of original doctorates in other areas, and to trace these lines from the first music doctorates to the present day. The trends of current practice, and especially as regard curriculums and structures, form a major portion of the study.

The study was designed to yield information on the following topics and related areas:

1. Historical development of the doctoral degree.
2. The emergence of the doctoral degree in music, and a true list of institutions sponsoring such programs.



3. Administrative structure of the degree, including control, accreditation, types and numbers of degree, fields of concentration, and teaching staffs.

4. Curricular structure of the degrees, including admissions, prerequisites, transfer credits, attendance plans, time, research tools, hours and courses available (by fields), advisement, examinations, dissertation, extra-curricular life of the student.

#### Procedure

The primary method of collecting data was through catalogues, published and unpublished brochures, and usual library resources. Originally, the plan of procedure included personal survey on the campuses. Twenty-three such surveys were made with the decision that there was no real advantage in the procedure. Questionnaires, correspondence, and personal interviews completed the procedures.

#### Major Findings

On the basis of tabulated information, coupled with subjective knowledge, the following conclusions were drawn:

1. Forty institutions currently sponsor doctoral degrees in music.
2. Public or private support has little to do with curriculum and philosophy.
3. Non-music offices usually administer the degree.
4. Degree names and types vary insignificantly.
5. Fields of concentration are confined in general to musicology (history, theory), composition, and music education, with scattered possibilities in applied, psychology, and church music.
6. Admissions procedures constitute perhaps the greatest point of variance among the forty institutions.
7. Thirty institutions use the semester plan while ten use the quarter plan of attendance.
8. Research tools requirements form the most controversial issue encountered through interviews.
9. Admissions, tools, qualifying, and final examinations form the usual pattern.
10. Total hours required for the degree vary significantly, although time requirements are fairly consistent.
11. Dissertations are commonly credited through enrollment in "Research and Directed Study."
12. Broad curriculum, bordering on "general education" forms the basic pattern for all curriculums surveyed.

#### Conclusions

Through subjective and objective interpretation of materials presented in this study, it is possible to define the validity of music as an area worthy of doctoral study. For the first time, comparatively complete data have been set forth concerning the various aspects of doctoral programs in music as offered through colleges and universities of America. It is hoped that bases have been cited for bridging seemingly divergent philosophies and for implementing sound educational and philosophical tenets, and for incorporating functional design within the frameworks of doctoral music programs. 218 pages. \$2.73. Mic 56-208

### ELEMENTARY TEACHERS' JUDGMENTS REGARDING THE ADEQUACY OF THEIR MUSIC PREPARATION

(Publication No. 15,467)

Arthur Francis Klein, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: William H. Vaughan

The purpose of the study was to ascertain whether the required music education courses taken in college by prospective elementary teachers adequately establish for them musical competencies needed for classroom teaching. In carrying out this purpose, the writer undertook (1) to determine what musical experiences the recently certified elementary teachers in Tennessee normally help to provide for their pupils; (2) to determine how well these teachers believe they are qualified to guide children in the various musical experiences common to the elementary classroom; and from a comparison of these data with the music teaching competencies recommended by music educators, (3) to make observations and recommendations for the improvement of the music education courses required of elementary education majors.

A check list type questionnaire was constructed and sent to 483 recently certified elementary teachers in all sections of Tennessee. A total of 276 questionnaires was returned.

The recommendations contained in the Music Education Curriculum Report, the Music Education Source Book, and a Guide for Teaching in Elementary Schools were bases for the list of music teaching activities and musical competencies used in the instrument.

Analysis of the data obtained in the questionnaire enabled the investigator to learn of present practice in the teaching of music and to know the participants' evaluations of the quality of music preparation they received during their pre-service experience.

#### Findings of the Study

1. The responsibility of teaching music to children in Tennessee's elementary schools rests upon the regular classroom teacher. Less than 10 per cent of the participants in the study have the services of a special music teacher or supervisor who does some of the music teaching for them.
2. Over 50 per cent of the music teaching activities are used only a few times each year.
3. The amount and type of pre-service music preparation influence the participants' frequency of use of the music teaching activities.
4. More than 50 per cent of the participants rely upon outside help to learn a new song. Participants indicate that the required courses provided only fair help in assisting them to learn to sing.
5. The piano playing competency of the participants is very poor. Instruction in playing the piano is not included in the courses taken by a majority of the teachers.
6. Only a few of the participants can play the autoharp. Most of the required courses did not include the playing of the autoharp.
7. Only fair preparation is reported for using over two-thirds of the music teaching activities.



8. Observation of the teaching of music to children and the actual teaching of music to them was not included in the training of many of the participants.

#### Recommendations

The following recommendations are made for consideration by those persons who plan and teach the required music education courses for prospective elementary teachers:

1. More attention needs to be given to developing the prospective teacher's capacity to sing.
2. Required music courses should include experience at the piano.
3. The playing of the autoharp should be a part of music courses required of elementary teachers.
4. Prospective elementary teachers need better preparation for using all of the teaching activities, skills, and procedures peculiar to the teaching of music.
5. Observation of the teaching of music and the actual teaching of music to children should be required of all prospective elementary teachers.

178 pages. \$2.23. Mic 56-209

#### STYLISTIC TREATMENT OF GREGORIAN MELODY IN SELECTED WORKS OF SEVENTEEN COMPOSERS (VOLUMES I AND II)

(Publication No. 15,474)

Wilford Davis Smith, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: Vernon H. Taylor

This study deals with the use of Gregorian melodies by composers of the Romantic and Modern periods. The objective was the determination of the composers' treatment of the melody on the basis of five elements of style: rhythm, melody, harmony, form, and color. Other incidental information which was sought included the types of melodies preferred by composers, the modes most widely used, the presence or absence of extra-musical connotations, and similar items.

#### Procedure

Since it was assumed that works by eminent composers would be of the greatest value to the study, the works chosen from the Romantic period were selected from the music of acknowledged masters. In the choice of Modern works, the basic list of composers was taken from those who received the most votes in a poll of an international jury of distinguished musicians. Several compositions by other outstanding composers were also included. Each passage in which a Gregorian melody appeared was analyzed as to (1) rhythmic treatment, (2) melodic treatment, (3) type of harmony, (4) structural features, and (5) color treatment.

#### Summary and Conclusions

Twenty-four different Gregorian melodies are used in the twenty-three compositions included in the study. The

syllabic chants (particularly hymns and sequences) are used most frequently, although several melismatic chants appear in recent works. The sequence *Dies irae* appears in more compositions than any other melody. The mode most often represented in the melodies is the Dorian; next in order come the Hypomixolydian, the Lydian, the Mixolydian, and the Hypophrygian.

In the majority of the works some extra-musical connection exists between the composition and the Gregorian theme employed. Developmental treatment of the melody varies from none (e.g., in Gounod's *The Redemption*) to extensive (e.g., in Creston's *Symphony No. 3*).

The rhythmic treatment of the Gregorian melodies is most often metrical, although considerable measured treatment is found, particularly in the later works. Only in three works do passages occur in which the rhythm closely resembles the original.

Complete liturgical melodies are used in six of the compositions analyzed, but in the majority of cases the plain-song appears in the form of a single phrase or motif. Some degree of alteration of the melody is found in most of the compositions, particularly in those in which extensive development occurs.

Tonal harmony is employed to a much greater extent than modal in the compositions included in the investigation. Only in rare short passages is the melody unaccompanied. Contrapuntal elements are present in most of the compositions. One work contains tone-cluster harmony, another is based upon the twelve-tone technique, and several possess quartal harmonic implications.

The total form of the works (or movements) containing Gregorian melodies consists of a variety of types. Free form is often found, as well as sonata, binary, ternary, and theme and variations. Irregular periodic structure is most frequent, although numerous examples of regular structure are also to be seen.

Thirteen of the compositions are scored for orchestra, some also including piano and some voices. There is little evidence of a general preference for assigning the Gregorian theme to a particular instrument or instrumental choir, but the strings predominate in the accompaniment in virtually all of the works. Little conclusive evidence regarding color was found in the remaining compositions, two of which are for string quartet, three for violin and piano, three for organ, one for a cappella voices, and one for piano.

A number of other works employing Gregorian themes or written in Gregorian style are listed for possible investigation by other interested persons.

606 pages. \$7.58. Mic 56-210

#### THE AFFEKTENLEHRE IN THE EIGHTEENTH CENTURY

(Publication No. 14,674)

Frederick T. Wessel, Ph.D.  
Indiana University, 1955

The primary objective of the investigation has been to establish the true attitude of the eighteenth century composers and theorists toward the expression of emotions in music. A secondary goal was the desire to better



understand music as a sociological and cultural force during the century, and to understand the way in which music reflected the general cultural trends of the period. It was believed that the secondary goal would be self-revealing through the evidence which was exhibited; therefore, the investigation was limited to the primary goal.

The study has been divided into three parts. Part I pertains to the musical aesthetics of the eighteenth century as revealed in the writings of the theorists of the period. The discussion is pursued in eight chapters, each dealing with a separate phase of the subject and introducing such problems as: 1) objectivity versus subjectivity in an affective music, and 2) the difference between instrumental music and vocal music as a means of affective expression. The various materials which lend themselves to manipulation in an affective music is also discussed, as is the physiological functioning of the body during an aesthetic reaction to music.

Part II is the main body of the study and reveals the manner with which the composer needed to treat the materials of music in order to create the affects he desired. The first four chapters deal with the more technical aspects of music: melody, harmony, key and rhythmic movement. Chapter V reveals the affective meaning of the more common Italian terms in use during the eighteenth century, while Chapter VI is devoted to the affective connotations of instrumental colors. Chapter VII discusses all phases of the importance of the word in the *Affektenlehre*, including such subjects as: oratorical expression, the relationship between music and the spoken word, the remnants of the *Figurenlehre*, the importance of word stress and the various means by which words could be stressed,

the way in which various types of punctuation could be reflected in different types of cadences, and the problems of word repetition and form. Chapter VIII reveals actual recommendations taken from writings of the eighteenth century, which try to show the manner of portraying specific emotions in music. Chapter IX is devoted to the performer. Each chapter of Part II is provided with a tabular summary showing the individual items discussed in the chapter and the affect which each item created.

Part III acts as a general summary, the first chapter being a summary as found in the sources themselves, where particular affects are said to be created by combining certain elements of Part II. Chapter II quotes a poem by Thomas Campion and reveals how those items, discussed in Part II, could be applied in order to create the most affective setting of the text. Chapter III is an analysis of an aria from an opera by Georg Benda, revealing the way in which the composers complied, or failed to comply, with the recommendations as handed to them by the theorists of the period. Chapter IV acts as a final conclusion showing how the *Affektenlehre* had developed from the objective symbolism of the Baroque into an empathetic emotionalism during the Enlightenment, only to become a free and disorganized emotionalism during the Romantic era.

Ninety-two musical examples have been provided to substantiate claims and statements made by the various writers. These musical examples come either from the practical music of the day or from examples quoted in the writings which have been investigated.

433 pages. \$5.41. Mic 56-211

## PHARMACOLOGY

### FACTORS INFLUENCING RELEASE OF LUTEINIZING HORMONE FROM THE PITUITARY GLAND

(Publication No. 15,444)

Philip Judson Campbell, Ph.D.  
The University of Oklahoma, 1955

Endocrine relationships concerned with the production, storage and release of the anterior pituitary gonadotropins, including Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH), have been studied by various methods. Since LH is considered to exhibit metabolic activity in addition to its effects on the gonads, its importance is receiving increasing recognition.

Because FSH and LH act synergistically and have not been isolated by chemical means, their true and independent actions have been difficult to establish. However, they react separately and independently to various types of influences, and can be separated by physiological means. LH is liberated from the anterior pituitary gland by certain estrogens and androgens. In the present study the effects of other compounds on the production and liberation of the pituitary FSH and LH were investigated. Also the retention of LH activity in pituitary implants under various conditions was observed.

Fresh pituitary glands from adult castrate male rats were transplanted under sterile conditions into the leg muscles of immature hypophysectomized female rats. Only FSH was released from these implants during a five day period in contrast to the release of both FSH and LH when similar adult donor glands were acetone-dried, powdered and injected as an aqueous suspension. Follicle stimulation and luteinization of the test animals ovaries were used as end points. The data presented suggests that when the assay animal is treated daily with estrogen, LH is released when a second implantation is performed three days after the first implant. Recovered implants, acetone-dried and injected into assay animals, appear to be depleted of FSH.

Several substances were assayed to determine their ability to liberate LH from the intact pituitary glands of adult castrate male animals. The pituitaries of the treated animals were acetone-dried, powdered and injected into hypophysectomized immature female rats. An ovarian response of only follicle stimulation was considered to mean the gland tested was at least largely depleted of LH.

Cortisone was ineffective in releasing LH from the pituitary of the intact animal. ACTH appeared to induce a partial release of LH from the pituitary which was thought



to be mediated through the effect of this substance on the production of adrenal androgens. The androgenic derivatives from the adrenal cortex, adrenosterone and 4-androstene-3,17-dione are effective in causing the release of LH from the pituitary gland though they are less potent in this regard than testosterone.

52 pages. \$1.00. Mic 56-212

**MODE OF ACTION OF VARIOUS METABOLIC INHIBITORS IN RELATION TO THE RENAL MECHANISM AFFECTING THE TUBULAR EXCRETION OF p-AMINOHIPURIC ACID (PAH)**

(Publication No. 14,689)

Abel Martin Dominguez, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor Frederick Earl Shideman

The transport of chemical substances across a cell membrane against a concentration gradient requires a supply of energy derived from cellular metabolic processes. Additional data are presented herein to support the hypothesis of Shideman and Rene (1951) that energy derived from succinate oxidation (and Krebs cycle oxidations) is involved in the renal tubular mechanism which effects the excretion of PAH.

The technique described by Cross and Taggart (1950) for the study of tubular excretion of PAH in renal cortical slices was employed in all *in vitro* studies. The *in vivo* effects of metabolic blocking agents on the PAH transport mechanism were evaluated in the following manner: one kidney was removed and the capacity of cortical slices prepared from it to accumulate PAH was determined. The inhibitor was administered and at varying periods of time thereafter the remaining kidney was removed and the uptake of PAH by slices prepared from its cortex measured.

The capacity of the renal slice, prepared from the rabbit, to transport PAH was inhibited approximately 80 per cent in the presence of  $2 \times 10^{-5}M$  4-fluorobutanoic acid (FB) or 6-fluorohexanoic acid (FH). Quantitatively similar results with fluoroacetic acid (FA) resulted only when a concentration ( $1 \times 10^{-2}M$ ) five hundred times as great was employed. Acetate (0.01M) increased the capacity of the renal slice to accumulate PAH and antagonized the inhibitory effects of FA, FB, and FH. In a similar manner, butyrate (0.01M), hexanoate (0.0005M), pyruvate (0.01M), acetoacetate (0.005M), and DL-beta-hydroxybutyrate (0.002M) enhanced the accumulation of PAH in the slice and counteracted, to varying degrees, the inhibitory effects produced by the fluorinated acids.

The possibility that FB and FH might be blocking the transport of PAH by a mechanism different than that which would obtain if they were first converted to FA was examined. A comparative study of the effects of FA, FB, and FH on the oxidation of various substrates by a mitochondrial preparation of kidney was undertaken and an attempt was made to isolate the antimetabolite (fluorocitrate) formed from FA and FB and to examine its effect on the oxidation of citrate. In the presence of  $1.78 \times 10^{-4}M$  FB or FH, the oxidation of butyrate, beta-hydroxybutyrate, acetoacetate, acetate, pyruvate, citrate, alpha-ketoglutarate,

succinate, fumarate, L-malate, or oxaloacetate was significantly inhibited (36-83 per cent). An equimolar concentration of FA had no demonstrable influence on the oxidation of the above substrates. FA and FB did not interfere with the formation of the acyl CoA derivatives of acetate and butyrate, respectively, and were activated (formed fluoroacyl derivatives of coenzyme A) only one-third as rapidly as the latter. An antimetabolite, presumably fluorocitrate, isolated from incubation of FA with the mitochondrial preparation inhibited the oxidation of citrate. Similar results did not obtain with FH.

A comparison of FA, FB, and FH on the transport of PAH by renal cortical slices prepared from various species was made. FB and FH were 500 times as potent as FA in inhibiting the tubular transport of PAH in renal slices prepared from the rabbit and guinea pig. This great difference in potency was not apparent in the dog, chicken, and rat.

The subcutaneous administration of sodium malonate (1.87 gm./kg.) resulted in a significant decrease (59.9 per cent) in the capacity of the kidney of the rat to accumulate PAH. When malonate was administered intravenously in doses ranging from 0.6 to 1.0 gm./kg., a linear relationship was found to exist between the extent to which the accumulation of PAH was inhibited and the dose. Antimycin A produced similar effects when administered intraperitoneally (3 mg./kg.), or intravenously (1 mg./kg.).

The above data, when correlated with the results of other investigators, indicate succinate oxidation provides an *in vivo* source of energy for that renal mechanism which is responsible for the tubular excretion of PAH. Evidence is presented to suggest that the higher fluorinated fatty acids, i.e. FB and FH, inhibit some phase of fatty acid oxidation subsequent to initial activation (formation of fluoroacyl CoA) but prior to condensation of acetyl CoA with oxaloacetate. The significance of the site of action of FA, FB, and FH in relation to the postulated excretory mechanism involved in the renal tubular transport of PAH is discussed.

89 pages. \$1.11. Mic 56-213

**A CORRELATIVE STUDY OF THE CHOLINESTERASE ACTIVITY OF BRAIN AND BLOOD**

(Publication No. 15,455)

James Wilks Lawson, Ph.D.  
The University of Oklahoma, 1955

There is evidence that decreased cholinesterase activity is associated with toxicological and pathological processes. The toxic symptoms resulting from the absorption of certain organic phosphorus insecticides are related to cholinesterase inhibition of the peripheral as well as the central nervous system. Decreased cholinesterase activity has also been indicated in disorders of the nervous system such as epilepsy and catatonic stupor. Increased cholinesterase activity has been reported in chronic psychotic patients and in mentally ill patients showing autonomic overactivity.

Since biopsies of brain cannot ordinarily be taken, it would be desirable to know if a correlation exists between the level of cholinesterase activity of brain, blood, and cerebrospinal fluid, particularly following absorption of the



organophosphorus enzyme inhibitors. The data heretofore reported by other investigators suggests a relationship between brain and erythrocyte cholinesterase activity which is only of questionable value in determining the degree of brain cholinesterase inhibition.

The present study is concerned with the correlation of the cholinesterase activity of brain, erythrocytes, and plasma following electroshock and various drugs.

The electrometric method of Michel was modified to measure the cholinesterase activity in tissues of the dog.

The results of this study show that the cerebrospinal fluid contains no detectable cholinesterase activity.

Di-isopropyl fluorophosphate (DFP) inhibits the cholinesterase activity of plasma, erythrocytes, and brain while electroshock, reserpine, atropine, metrazol, and insulin appear to have no significant effect upon cholinesterase activity. The sensitivity of cholinesterase activity to inhibition by DFP is in the increasing order of erythrocytes, brain, and plasma.

No overt signs of toxicity were manifested when brain and erythrocyte cholinesterase activity was lowered to within 30 to 50 per cent and 30 to 60 per cent, respectively, of control levels by DFP.

The whole brain homogenate was found to be necessary to determine quantitatively the effect of drugs upon cholinesterase activity "in vivo." Following a dose of DFP, 2 mg./Kg. intravenously, no retained DFP was found in brain tissue which had not already reacted with cholinesterase.

It is concluded that a relatively good correlation exists between erythrocyte and brain cholinesterase activity in the control animals and in the experimental animals following inhibition by DFP, and particularly after DFP plus electroshock. There appears to be no correlation between the cholinesterase activity of plasma and erythrocytes or between plasma and brain, either before or after the drugs used.

64 pages. \$1.00. Mic 56-214

#### PHYSICAL CHEMICAL STUDIES OF ANTIHISTAMINICS RELATIVE TO THEIR PHARMACOLOGICAL PROPERTIES

(Publication No. 14,413)

Nicholas George Lordi, Ph.D.  
Purdue University, 1955

Major Professor: John E. Christian

A study was made of the physical properties and stereochemistry of antihistaminics as well as their effects on certain complex systems with the intent of obtaining information which would prove of value in the prediction and interpretation of their physiological effects.

The apparent ionization constants of 16 antihistaminics; their relative surface activities at pH's 3 and 7.4; the solubilities of their bases in water and buffer, pH 7.4, at 37.5°C.; and their apparent partition coefficients for the system 1-octanol/buffer, pH 7.4, at 37.5°C. were reported. Their surface activity and partition coefficients tended to parallel the reciprocal of the solubilities. Changes in structure which tended to reduce basicity also tended to lower solubility. No correlation existed between any one physical property and antihistaminic activity.

The ability of the antihistaminics to suppress the polarographic oxygen maximum was investigated. No correlation could be made with surface activity. The effect of change in polarity of the nonaqueous phase on the distribution properties of seven selected antihistaminics was also studied. The more polar the solvent, the greater the tendency of the compound to distribute. Antihistaminics were also found to condense the sodium oleate coacervate, their relative effectiveness in doing this depending on the degree of nonpolarity of the molecules. Additional studies were made of their effect on phase boundary potentials and their uptake by the ion exchange resin Amberlite IRC-50.

The steric aspects of antihistaminic action were discussed, assuming Pfeiffer's "umbrella-structure" to be the histamine-blocking moiety. All potent antihistaminics could assume umbrella-configurations with approximately the same dimensions.

In the interpretation of the physiological effects of antihistaminics, solubility was shown to be the most important single property. The least soluble antihistaminics have been observed to possess relatively low toxicities, slow onset of action, and prolonged duration of effect. A method of predicting approximate local anesthetic potencies relative to procaine from solubilities was also indicated.

The ethyldinium ion and thiosulfate substitution product of N-ethyl-N-1-naphthylmethyl-2-chloroethylamine were both found to be polarographically reducible, their half-wave potentials (-0.7 to -0.9 volts) varying with pH and concentration. Mechanisms of reduction were postulated and evidence given to show that a linear relationship existed between diffusion currents and concentration.

Correlation of the physical properties of antihistaminics with their pharmacological effects was limited by the lack of suitable data. Emphasis was placed on the usefulness of such data in elucidating specific drug action. Assuming free access to the site of action, correlation should be observed between any given physical property and antihistaminic activity, holding all other factors constant. The antihistaminic effect is dependent on the balance between the nonpolar, polar, and ionic portions of the molecule as modified by its steric configuration.

197 pages. \$2.46. Mic 56-215

#### AN APPROACH TO THE THERAPY OF CARDIOVASCULAR HYPERTENSIVE DISEASE WITH A PHARMACOLOGIC AGENT: PHARMACOLOGIC STUDIES OF 8-(PARA-AMINOBENZYL)-CAFFEINE AND OTHER RELATED COMPOUNDS

(Publication No. 15,301)

William Edward O'Malley, Ph.D.  
University of Maryland, 1955

Supervisor: Professor John C. Krantz, Jr.

Cardiovascular disease is the major cause of death in the civilization of the West and especially in the United States. This dissertation was confined to the singular division of cardiovascular disease having the highest mortality rate, the so-called "primary hypertensive disease."

Primary hypertensive disease and its complications



involving cardiac, cerebral, and renal areas have been adjudged to cause more death and premature superannuation than cancer.

The hemodynamic alterations of primary hypertensive disease were discussed. The various contemporary theories of the pathogenesis of primary hypertensive disease were considered. The case for the justification of a search for an alleviating pharmacologic agent was presented.

A screening procedure involving the selection of a potent vasodepressor agent from a series of synthetic Xanthine derivatives was described.

8-(para-Aminobenzyl)-caffeine (PABC) was selected from the foregoing group of Xanthine derivatives for a detailed pharmacologic investigation.

Vasodepressor response to PABC of laboratory animals and man were measured. PABC was given by various routes of administration in these experiments. Oral absorption was found to be excellent. The vasodepressor effect of PABC was effective to both the normotensive and the hypertensive subject. Renal blood flow was not significantly altered following the administration of PABC. Coronary circulation was markedly increased following the administration of PABC.

An elaborate toxicologic study was performed. PABC appeared innocuous to the common laboratory animals. Mechanism of action studies revealed that PABC acted directly upon smooth muscle to elicit relaxation of tonus.

Preliminary clinical trials were made, and successful results on a limited group of outpatients prompted recommendation of extensive clinical studies of PABC under the guidance of experienced clinicians.

122 pages. \$1.53. Mic 56-216

#### A STUDY OF AN ISOTOPE DILUTION ASSAY FOR THE DETERMINATION OF AMPHETAMINE

(Publication No. 14,423)

Russell Alfred Rockerbie, Ph.D.  
Purdue University, 1955

Major Professor: John E. Christian

The objective of this research problem was to study the limitations and usefulness of isotope dilution assays for the determination of microquantities of organic medicinals. For this purpose, the labeled derivative modification of the inverse isotope dilution method of assay has been applied to the quantitative determination of microgram quantities of amphetamine.

The labeling of o-iodobenzoyl chloride with iodine-131 is described. This reagent was used to produce a labeled derivative of amphetamine. Amounts ranging from 1 to 150 ug. of amphetamine in 0.5 ml. of 5 per cent potassium hydroxide solution were treated with the labeled reagent in a sealed ampul. The ampul was then broken open, a weighed amount of the unlabeled o-iodobenzoyl derivative of amphetamine was added, and intimate mixing was allowed to occur. A chloroform extract of the reaction mixture was made and the product was crystallized several times. Similarly a quantity of about 2 mg. of amphetamine was treated, but no diluent was added. The purified

samples were weighed and counted. Calculations were made by the use of the following equations:

$$G_1 = G_2 \left( \frac{\text{Sp. Ac.}_f}{\text{Sp. Ac.}_i - \text{Sp. Ac.}_f} \right) \frac{M_1}{M_2}$$

where  $G_1$  = weight of labeled material (unknown originally present),  $G_2$  = weight of unlabeled diluent added,  $\text{Sp. Ac.}_i$  = specific activity of  $G_1$  (undiluted labeled material),  $\text{Sp. Ac.}_f$  = specific activity of the isolated unknown sample,  $M_1$  = molecular weight of material being determined, and  $M_2$  = molecular weight of derivative.

Using this technique a total of seventeen determinations were made on quantities of amphetamine ranging from 10 to 150 ug., an average recovery of 100.3 per cent was obtained. Standard deviation: 6.6 per cent. A total of eight determinations were made at the 1 ug. level. An average recovery of 118 per cent was obtained. Standard deviation: 28 per cent.

Samples of serum containing amphetamine ranging from 10 to 50 ug. were extracted by shaking with benzene. The benzene extract was extracted with normal hydrochloric acid solution, evaporated to dryness, and the residue was analyzed using the procedure described. An average recovery of 99 per cent was obtained. Standard deviation: 7.4 per cent.

Samples of whole blood were equilibrated with 10 ug. quantities of amphetamine. The plasma was removed and analyzed using the procedure described for serum. An average recovery of 91 per cent was obtained. Standard deviation: 19 per cent.

The general procedure described is applicable to the determination of any organic compound which may be quantitatively converted into a labeled derivative, isolated, and purified. The limiting factor is the purity which may be obtained in the preparation of a sample for specific activity determination.

Suggestions are made by which the efficiency and the general applicability of the method may be increased. Equations are derived for a method of assay in which a second label may be used to make possible purification by paper partition chromatography, and to eliminate the need for weighing the samples. 95 pages. \$1.19. Mic 56-217

#### COMPARATIVE EFFECTS OF CERTAIN NONNARCOTIC ANALGESICS ON THE PAIN-INDUCED LOWERING OF TOTAL NONPROTEIN SULFHYDRYL CONTENT OF RAT LIVER

(Publication No. 14,430)

Edward L. Takesue, Ph.D.  
Purdue University, 1955

Major Professor: Dr. T. S. Miya

An investigation was made of the effects of various factors and drugs on the total soluble nonprotein sulfhydryl content of rat liver. It was found that the combination of fasting, hydration and bilateral tourniquets resulted in the lowest mg.% of the sulfhydryl content. Acetylsalicylic acid, 500-600 mg./Kg., salicylamide, 150 mg./Kg., and acetophenetidin, 600 mg./Kg., inhibited the decrease of the

total nonprotein sulfhydryl content in the liver of the rat subjected to stress. Sodium phenobarbital, 50 mg./Kg., and morphine sulfate, 10 mg./Kg., also gave similar results. Aminopyrine, 100-600 mg./Kg., and sodium salicylate, 200-750 mg./Kg., failed to inhibit the decrease of sulfhydryl content of the stressed rat liver. At the large doses, both aminopyrine and sodium salicylate proved

fatal to the animals tested. It was possible to demonstrate that sodium salicylate at the 200 mg./Kg. dose level caused a decrease of the sulfhydryl content without the use of tourniquets. This study indicates that the protection of the total nonprotein sulfhydryl content of the stressed rat liver is of a low degree of specificity.

76 pages. \$1.00. Mic 56-218

## PHYSICS

## PHYSICS, GENERAL

A STUDY OF THE MEASUREMENTS OF  
ULTRASONIC ABSORPTION IN LIQUIDS

(Publication No. 14,269)

Sankarambadi S. Chari, Ph.D.  
Michigan State University, 1955

The significance of measurements of ultrasonic absorption in liquids is mentioned. A critical study of different experimental methods of ultrasonic absorption in liquids are classified as to the nature of the type of waves and to the particular characteristics of absorption in liquids. The necessity for a comparative study of the experimental methods of studying the absorption of these waves is given. Experimental measurements of ultrasonic absorption in liquids are made by two methods: 1. The method of Isochromates, and 2. The method of the image of sound intensity; as a first step for a comparative measurement of ultrasonic absorption in liquids. The results achieved are not conclusive enough to draw any definite conclusion. However, these measurements indicate possibilities of more accurate comparative measurements of ultrasonic absorption in liquids.

56 pages. \$1.00. Mic 56-219

THE EFFECT OF PRESSURE  
ON THE SUPERCONDUCTING TRANSITION OF LEAD

(Publication No. 15,215)

Richard Robb Hake, Ph.D.  
University of Illinois, 1955

Recent experimental and theoretical work has emphasized the fundamental role of the crystal lattice in the phenomenon of superconductivity. In the isotope effect it was shown that the zero-field transition temperature  $T_0$  is inversely proportional to the square root of the average isotopic mass  $M$ . This result strongly suggests that the interaction which is responsible for superconductivity is between electrons and phonons and that the strength of the interaction is proportional to the mean square amplitude of the lattice vibrations. Bardeen and Frohlich have sought to formulate this interaction but certain difficulties appear in their theories.

In order to gain more insight into the electron-phonon interaction it appears advisable to study the effects on  $T_0$  of changing the lattice in some way other than by changing the atomic mass. By applying pressure to a superconductor it is possible to reduce the interatomic distance and thereby change the frequency of the normal modes of the lattice vibration.

We have applied hydrostatic pressures up to 4300 p.s.i. on a pure single crystal of lead and measured the resulting shifts in the critical field. Lead was chosen for this study because, unlike most superconductors upon which pressure effect measurements have been made, it has a cubic lattice. This insures that hydrostatic pressure will result in a uniform contraction of the lattice without complicated shearing effects. Furthermore, the effects of pressure on the electrical resistivity of lead indicate that pressure-induced changes in the electronic band structure are not large. Lastly, by making measurements of the critical field shift just below the high transition temperature of lead, it is possible to apply relatively large pressures through fluid helium without its solidifying and thereby obtain a rather accurate value for the pressure coefficient.

A specially designed cryostat and a carbon-thermometer actuated heater enabled us to maintain temperatures constant to within  $10^{-4}$  °K at about 7°K. The transition fields were measured to within a few hundredths of a gauss by a sensitive ballistic method. A comparison technique was used, pressure being applied to one specimen while another identical specimen served as a zero-pressure comparison. While temperature and pressure were maintained constant the critical fields of the two specimens were measured alternately in fairly rapid succession. The difference in the two critical fields gave the pressure-induced shift  $\Delta H_c$ . The measurement was repeated at various pressures up to 4300 p.s.i.

The  $\Delta H_c$  vs.  $P$  curve was linear with a slope of

$$\left(\frac{\alpha H_c}{\alpha P}\right)_{T_m} = -(9.60 \pm .11) \times 10^{-9} \frac{\text{gauss}}{\text{dyne cm.}^{-2}}$$

where  $T_m$  is the average temperature at which the measurements were made, 7.09°K, and the error is the probable error as computed from the residuals of the separate points. From a theoretical expression for the temperature dependence of  $\left(\frac{\alpha H_c}{\alpha P}\right)_T$ , and from the slope of the  $H_c$  vs.  $T$  curve at the zero-field transition temperature  $T_0$ , we find, respectively



$$\left(\frac{\alpha H_c}{\alpha P}\right)_{T_0} = -(9.79 \pm .21) \times 10^{-9} \frac{\text{gauss}}{\text{dyne cm.}^{-2}}$$

$$\left(\frac{\alpha T_c}{\alpha P}\right)_{T_0} = -(4.39 \pm .23) \times 10^{-11} \frac{^\circ\text{K}}{\text{dyne cm.}^{-2}}$$

where the errors in the above derivatives include, in addition to the experimental error in  $\left(\frac{\alpha H_c}{\alpha P}\right)_{T_m}$ , the estimated errors in the functions used to compute them.

The results for  $\left(\frac{\alpha T_c}{\alpha P}\right)_{T_0}$  are in good agreement with the value for this quantity given by a simple theoretical treatment due to Marcus. We believe that the agreement between a simple theory (Marcus) and a simple example (lead) for the pressure effect provides another confirmation of the basic postulates of the Bardeen-Frohlich theory. In addition, this result may provide some clue as to the more detailed nature of the electron-lattice interaction.

99 pages. \$1.24. Mic 56-220

### THEORY OF ENANTIOMORPHIC PARTICLES OF ARBITRARY SPIN

(Publication No. 14,400)

Joseph David Harris, Ph.D.  
Purdue University, 1955

Major Professor: David C. Peaslee

A set of manifestly covariant wave equations is given for particles of unique rest mass and arbitrary spin greater than  $\frac{1}{2}$ . These equations are transcribed to the convenient matrix or "particle" form  $(\alpha^\mu \partial_\mu - ix)\psi = 0$  by means of a set of Dirac-Fierz spinor-matrices. Several important properties of the matrices  $\alpha_\mu$  including their Hermitian ( $\alpha_0$ ) or anti-Hermitian ( $\alpha_1, \alpha_2, \alpha_3$ ) character, enantiomorphic property (symmetry of  $\alpha_0$  with respect to exchange of its blocks across the transverse principal diagonal) and minimal equation  $\alpha_0(\alpha^2 - 1) = 0$  are derived. It is shown that the only relativistically invariant, irreducible wave equations of the form  $(\alpha^\mu \partial_\mu - ix)\psi = 0$  for which the  $\alpha_\mu$  have the above-mentioned properties are just those originally introduced. It is shown that there are  $4(2s + 1)$  linearly independent, plane-wave solutions of the wave equations, of which there are  $2s + 1$  for each sign of the frequency and for each parity where  $s$  is the spin.

As a preliminary to quantization of the field, a Lagrangian is given from which the field equations may be derived by a variational principle; in addition, a set of covariant commutation relations is postulated. The field is then quantized by the usual method of expansions in momentum eigenfunctions and definitions of occupation number operators. It is found that mathematical consistency in the treatment of fermions can be secured only by requiring that particle and antiparticle states have opposite relative parities. In the case of bosons, the physical requirement of a positive definite total energy for the field imposes the condition that boson fields have a determinate parity, which may be either odd or even.

The electromagnetic interaction may be introduced in the usual way by replacing  $\partial_\mu$  by  $\partial_\mu - ie A_\mu$  in the Lagrangian. The resulting field equations have the same

form as those of quantum electrodynamics, and the invariant perturbation theory developed for solving the latter may be applied to them. No difficulties are occasioned by "subsidiary conditions," since there are none in the theory.

Finally, it is shown that the divergences which occur in the application of the invariant perturbation theory to the field equations are minimal, in the sense that the propagation functions contain the lowest possible power of the propagation vector  $k_\mu$ , namely the second, which can be present with particles of unique rest mass and spin other than  $\frac{1}{2}$ .

47 pages. \$1.00. Mic 56-221

### ADDITIVE V CENTERS IN POTASSIUM IODIDE AND POTASSIUM BROMIDE

(Publication No. 15,223)

Bland Bryan Houston, Jr., Ph.D.  
University of Illinois, 1955

Additive V centers in KI and KBr are produced by the introduction of a stoichiometric excess of halogen into the crystals. In these experiments the deviations from stoichiometry were produced by treatment of single crystals at temperatures near their melting points under pressures of from 5 to 50 atmospheres of halogen vapor. Mollwo<sup>1</sup> first studied the optical and electrical properties of crystals treated in this manner. He found that this treatment produced optical absorption bands in the near ultraviolet, which are called V bands.

In this experiment the effects of the absorption of light in the V bands were studied at both room temperature and at the temperature of liquid nitrogen. Changes in the absorption spectra were observed. An attempt was made to observe photocurrents associated with the optical destruction of these centers.

Due to the complex band structure found in these crystals the changes in the absorption spectra are different to interpret. The quantum yields for the destruction of the centers are very low; about 1000 photons are absorbed for each center destroyed. The original bands could be partially restored by warming the crystals. The photocurrents were too small to observe; however, the sensitivity of the apparatus used was great enough that a meaningful upper limit could be set on the quantity  $\eta w/E$ , where  $\eta$  is the probability that a photon which is absorbed will release a hole,  $w$  is the average displacement of the hole in the direction of the field before it is trapped, and  $E$  is the field in the crystal. The value of this quantity was found to be less than  $10^{-12} \text{ cm}^2/\text{volt}$  for these centers.

90 pages. \$1.13. Mic 56-222

1. E. Mollwo, Ann. Physik 29, 394 (1937).



# ORIENTATIONAL PHASE TRANSITIONS IN SOLID METHANE

(Publication No. 14,409)

Thomas A. Keenan, Ph.D.  
Purdue University, 1955

Major Professor: H. M. James

This thesis presents a statistical theory of the orientational order in solid methane. The methane molecule is treated as a rigid spherical rotator with a charge distribution having tetrahedral symmetry. The Coulomb interaction of such symmetrical charge distributions decreases rapidly with increasing separation; the theory therefore takes account only of the interactions of next-neighbor molecules in the cubic close-packed lattice. The treatment employs classical statistical mechanics in the internal field approximation, thus neglecting the effects of the quantization of rotational energy and of nuclear statistics. The results are compared with the observed properties of  $\text{CD}_4$ , which should be more accurately describable by a classical theory than  $\text{CH}_4$ . The theory, which is realistic primarily as regards the assumed orientational coupling of the molecules, predicts the existence of the two  $\lambda$ -point transitions observed in  $\text{CD}_4$ , and gives fairly accurate descriptions of their properties. It therefore appears that considerable weight should be given to the prediction of the theory as to the types of order to be expected in solid methane, which differ markedly from the types hitherto considered.

Chapter I presents a brief historical survey of the problem, and Chapter II a complete description of the model to be used. A mathematical formalism for the classical calculation of the Coulomb interaction between molecules is developed in Chapter III. Use of special sets of surface harmonics and related orientational functions results in relatively simple expressions for the molecular interactions as a function of orientation and of relative position in the lattice. In Chapter IV the ordering effect of molecular interactions is considered. Two types of order — "uniform" and "alternating" — are selected for preliminary consideration because of their simplicity and stability. The extremalization of the free energy for each type of order gives a condition on the orientational distribution function — the consistency condition — for that type of order. It is shown later (in Chapter VI) that alternating order is less stable than a more complex but highly symmetrical type of order, called Type A order, with an eight-fold sublattice structure.

Several successive approximations are used in solving the consistency conditions for uniform order and Type A order. The crudest approximation (infinitesimal solution) yields the temperature at which the ordered state passes continuously into the disordered state. A better approximation yields limiting forms for the distribution functions and the free energy in the neighborhood of the branching temperatures. The distributions, first obtained as limiting forms, are then shown to be exact solutions of the consistency condition for all temperatures below the branching temperature. These distributions are then used in more accurate numerical calculations of thermodynamic functions for the ordered states of the crystal.

From the free energy curves, one finds that the model is disordered above a temperature  $T_c$ , has Type A order

between temperatures  $T'_c$  and  $T_c$ , and has uniform order below  $T'_c$ . The theory predicts  $T_c/T'_c = 1.11$ . With an interaction parameter of reasonable magnitude, the transition temperatures agree reasonably with the observed temperatures in  $\text{CD}_4$ ; the heats of transition also agree with the observed heats. The higher transition is second order, the lower first order. Superheating or supercooling of crystalline domains at the lower transition temperature would result in the qualitative behavior observed in  $\text{CD}_4$ . The specific heat anomalies derived from the model are unusually sharp for a calculation based on the internal field approximation. 181 pages. \$2.26. Mic 56-223

# INTERFEROMETRIC WAVELENGTH MEASUREMENTS OF GERMANIUM LINES OF A HOLLOW CATHODE DISCHARGE

(Publication No. 14,433)

Robert Dale Van Veld, Ph.D.  
Purdue University, 1955

Major Professor: Karl W. Meissner

Interferometric measurements of forty-one germanium arc lines in the wavelength region from  $\lambda 4685\text{\AA}$  to  $\lambda 2019\text{\AA}$  have been performed.

Experiments carried out with three models of cooled hollow cathode discharge tubes equipped with cast germanium electrodes show the suitability of this type of source for the production of sharp, relatively intense spectral lines. The construction and operation of a germanium slot hollow cathode tube of simple design is discussed.

Precision measurements made with a 6-mm and a 20-mm Perot-Fabry interferometer using  $\text{Hg}^{198} \lambda 5460.7532\text{\AA}$  as the standard wavelength show that the germanium lines are of superior quality and merit use as secondary standards.

In addition to providing precision values for the germanium lines, the wavelength measurements were employed for the following purposes:

1. Establishing precision value for the even  $4s^2 4p^2 \ ^1S_0$  level,
2. Confirming the odd  $4s^2 4p 5s( \ ^3P_2^o, \ ^1P_1^o )$  levels,
3. Establishing new precision values of sixteen odd levels:
  - a.  $4s^2 4p 4d( \ ^1D_2^o, \ ^3D_{1,2,3}^o, \ ^3F_{2,3}^o, \ ^1F_3^o, \ ^3P_2^o, \ ^1P_1^o )$
  - b.  $4s^2 4p 5d( \ ^3D_1^o, \ ^1D_1^o, \ ^1P_1^o )$
  - c.  $4s^2 4p 6s( \ ^3P_1^o, \ ^1P_1^o )$
  - d.  $4s^2 4p 7s \ ^1P_1^o$
  - e.  $4s 4p^3 \ ^3P_1^o$
4. Establishing twenty-three standard lines in the vacuum ultraviolet, between  $\lambda 1998\text{\AA}$  and  $\lambda 1691\text{\AA}$ , by application of Ritz' Combination Principle.

Proposals are made for extending the investigation to include:

1. Procurement of grating spectrograms of the calculated vacuum lines.



2. Studies of operating characteristics at various pressures and tube currents and with different carrier gases.
  3. Possible design of sealed-off discharge tube.
  4. Lifetime studies of the various discharge tubes.
- 81 pages. \$1.01. Mic 56-224

## PHYSICS, ELECTRONICS AND ELECTRICITY

### THE EFFECT OF NOISE ON OSCILLATOR STABILITY

(Publication No. 15,371)

George Hetland, Jr., Ph.D.  
Stanford University, 1955

In almost all oscillator applications a high degree of oscillator frequency stability is desirable; stability is particularly attractive if it can be obtained from an oscillator with other desirable attributes. In many oscillator applications a wide tuning range is also quite desirable.

At radio frequencies, oscillators possessing the two features of stability and wide tuning range are readily available. Many of the oscillators used at microwave frequencies, however, do not possess a high degree of frequency stability. Most of the microwave oscillators having a really high degree of frequency stability have a very restricted tuning range; an example of such an oscillator is a system made up of a radio-frequency quartz crystal oscillator followed by several cascaded tuned frequency multipliers.

The study herein reported was undertaken with two parallel goals in mind; (a) contribution to the theoretical understanding of oscillator operation, and (b) the development, if possible, of a practical microwave oscillator combining the desirable features of high frequency stability and wide tuning range. Such an oscillator would be very useful in laboratory measurements and in several military applications.

A basic limitation is placed on oscillator frequency stability by internal disturbances generated in the necessary amplifying tube and its associated circuit. (In theory, at least, it is possible to eliminate the effects of external disturbances by the use of such measures as controlling the environment and using extremely pure electrode supply voltages.) The internal disturbances in the amplifying tube and circuit are generally grouped together and called noise because of their similarity to thermal resistance noise.

Conventional oscillator analysis assumes that, with the application of electrode voltages to the amplifying tube, the system is shocked into oscillation by an impulse of noise. It is further assumed that the oscillator in the steady state emits a sinusoidal output signal, with perhaps a few harmonics. The assumption of a sinusoidal output signal is not strictly true, however, because the noise which initiated the oscillations continues to exist, and exerts a definite effect on the oscillator output signal.

One can, by considering the oscillator as a regenerative amplifier of its own noise, calculate the half-power

bandwidth of the oscillator output signal in terms of the oscillator parameters. This output half-power bandwidth of the regenerated noise is a useful yardstick for measuring the performance of an oscillator; a small noise bandwidth indicates a relatively constant output frequency.

The regenerative-noise-amplifier theory is considered in some detail in this study, and is applied to several actual oscillator circuits. The effect of an instantaneous amplitude limiter on the noise bandwidth is calculated. It is shown that amplifiers such as the traveling-wave tube, when used in a simple regenerative oscillator circuit, should be operated at maximum output for maximum stability. The reduction of the noise bandwidth of an oscillator by automatic frequency control is analyzed.

So as to test some of the conclusions developed, an experimental oscillator operating in the 3000 Mc/s range and employing a traveling-wave tube as amplifier and a tunable cavity as resonator was built. The only real limitation on the tuning range of the oscillator was that imposed by the tube which had a nominal 2-to-1 frequency range. The experimental oscillator is described in detail.

The traveling-wave-tube oscillator exhibited stability comparable to that of a crystal oscillator--frequency multiplier system. Although a bandwidth as small as that predicted by the theory was not achieved, the high stability attained is considered as partial verification of the theory. The very smallness of the theoretical bandwidth makes it extremely difficult adequately to reduce extraneous influences, and a number of the latter rather obviously were still present. The bandwidth obtained was sufficiently small that further refinements were judged unwarranted at the present time.

109 pages. \$1.36. Mic 56-225

### ELECTRICAL CONDUCTIVITY, MAGNETORESISTANCE, AND HALL EFFECT IN GRAY TIN FILAMENTS

(Publication No. 15,141)

Elton Everett Kohnke, Ph.D.  
Northwestern University, 1955

Results of measurements of the electrical conductivity, magnetoresistance, and Hall effect as functions of temperature are given for solid filaments of pure gray tin and similar filaments of alloys of gray tin containing various amounts of Sb, As, In, Al, and Zn. For 99.998% pure tin n-type conductivity is observed. The intrinsic activation energy as determined in the usual fashion from the slope of the conductivity curve is 0.082 eV and the conductivity at 0°C is 2090 ohm<sup>-1</sup> cm<sup>-1</sup>. Addition of impurities results in an increase of the "apparent" (as above) activation energy and a decrease in the absolute value of the conductivity in the intrinsic range. Samples doped with n-type impurities exhibit a positive temperature coefficient of resistance at low temperatures whereas the low-temperature conductivity of p-type samples becomes temperature independent at high impurity concentrations. The three p-type impurities In, Zn, and Al show marked differences in their effectiveness in producing p-type conductivity, In being 40 times more effective than Al.

The transverse magnetoresistance coefficient shows a stronger temperature dependence in the lattice-scattering region than is predicted by simple theory. The highest



coefficient is obtained for pure samples and the addition of n-type impurity causes a decrease in the low-temperature values. The addition of p-type impurities reduces the effect to a much greater degree and with high concentrations of p-type impurities the change of conductivity becomes too small for accurate measurement. A small longitudinal effect is found in contradiction to simple spherical energy-surface theory.

It is found that electron and hole mobilities given by the expressions  $\mu_n = 3.02 \times 10^7 T^{-1.65} \text{ cm}^2/\text{volt sec}$  and  $\mu_p = 2.18 \times 10^8 T^{-2.0} \text{ cm}^2/\text{volt sec}$  combined with an impurity concentration of  $2.5 \times 10^{17} \text{ electrons/cm}^3$  give a good fit to the experimental data for the conductivity and Hall coefficient of the pure sample in the range extending 100 degrees down from the highest measurement temperature. The intrinsic energy gap at absolute zero indicated by this analysis is 0.094 ev. The electronic and hole effective masses are shown to be approximately equal and to have the value 0.68 electron masses if the temperature change of energy gap is taken to be  $-5 \times 10^{-5} \text{ ev/degree}$ . It is also shown that the assumption of the applicability of classical statistics has doubtful validity at the extremes of the temperature range. Similar computations and results are discussed for other samples doped with n-type impurities. In contradiction to the results for n-type samples, p-type samples indicate mobility ratios slightly higher than unity. There is no indication, however, of extremely high mobility ratios such as those found in InSb. The effective impurity concentrations as calculated from low temperature Hall coefficient values are too large to be accounted for by the amount of added impurity. The suggestion is advanced that microscopic deformations of the lattice structure may lead to additional acceptor levels. Determination of the variation of Hall coefficient with magnetic field shows a shift of the crossover to higher temperatures with increasing field strengths, qualitatively in agreement with isotropic theory. 97 pages. \$1.21. Mic 56-226

#### A MATHEMATICAL STUDY OF BEYOND THE HORIZON SCATTER PROPAGATION

(Publication No. 15,305)

Harold Staras, Ph.D.  
University of Maryland, 1955

Supervisor: Professor Ferdinand G. Brickwedde

In the past decade or so, it has been observed that the frequency band between 50 Mc and 4,000 Mc, approximately, could be used fairly reliably for long distance communication (i.e., when the transmitter and receiver are well beyond each others horizon). The dominant characteristics of these long distance signals are their high signal strength (as compared to any previously known theory) and their fairly severe and rapid fading. Because of these characteristics, a scattering mechanism was postulated. Booker and Gordon, using an approach originally developed by Pekeris for the scattering of sound waves, were the first to develop an appropriate mathematical approach for scattering of radio waves by random inhomogeneities in the troposphere.

It is the purpose of this paper to extend their work by

deriving appropriate formulae for the important statistical parameters of the scattered radiation in terms of the statistical properties of the random inhomogeneities. Except for evaluating the rapidity of fading, the only statistical property of the random inhomogeneities required is its three dimensional auto-correlation function. The parameters that are considered in this paper include: (1) the depth and rapidity of fading, (2) the correlation of the amplitude and the phase of two signals coming to separated antennas or on two different frequencies, (3) the effect of antenna height on the received signal. These parameters are evaluated as a function of frequency and distance for both isotropic and anisotropic turbulence. In particular, the effects of anisotropy on the "scattered" signal are discussed in some detail. Comparisons are made with existing data which are rather encouraging and seem to indicate that anisotropy does exist in atmospheric turbulence.

This paper restricts itself to the phenomenon of scattering of radio waves over sufficiently long paths so that the transmitter and receiver are well beyond each others horizon. 113 pages. \$1.41. Mic 56-227

#### EFFECT OF VARIOUS ATMOSPHERES ON GERMANIUM CRYSTAL RECTIFIERS

(Publication No. 15,078)

Randall McVay Whaley, Ph.D.  
Purdue University, 1947

Major Professor: K. Lark-Horovitz

Quantitative measurements of voltage-current characteristics have been made for point contacts on various germanium alloys prepared in a high vacuum ( $3 \times 10^{-8} \text{ mm Hg}$ ), tested in a high vacuum, and after admission of gases at various pressures. Samples fall into three classes (a) relatively high purity germanium which provided poor rectification in vacuo and was unchanged by admission of gas, (b) one sample which showed reversible changes upon admission of air, and (c) samples of relatively high conductivity, due to impurity content, which provided good rectification in vacuo and showed irreversible increases in back resistance by factors of 10 to 1000 upon admitting air. Similar changes, usually to lesser extent, followed admission of nitrogen. Observed changes can be accounted for using the multi-contact theory by assuming the removal of very small areas of negative contact potentials and of low positive contact potentials, either by covering them with insulating layers or by converting them to regions of higher positive contact potential. On highly conducting samples, irreversible increases in back resistance were most pronounced at low voltages, but increases did extend to the voltage peak. The peak voltage sometimes was increased by admission of air, usually by factors less than three. 85 pages. \$1.06. Mic 56-228



## PHYSICS, NUCLEAR

## A MEASUREMENT OF THE HIGH-ENERGY END OF THE BREMSSTRAHLUNG SPECTRUM\*

(Publication No. 15,370)

Donald Charles Hagerman, Ph.D.  
Stanford University, 1955

Results of a differential measurement of the upper six percent of the bremsstrahlung photon spectrum produced by  $500 \pm 25$  Mev electrons agree with the Bethe-Heitler formula within the combined experimental errors of approximately 25 percent. This measurement was made by running a collimated beam of  $10^3$  electrons per pulse through a diffusion cloud chamber and observing the electrons degraded in energy by the production of a gamma ray. Observation of electron-electron scattering events provided a normalization in the center of the energy region investigated. A total of 330 events was observed. The performance of a diffusion cloud chamber under these conditions is discussed. 72 pages. \$1.00. Mic 56-229

\*The research reported was sponsored by the joint program of the U. S. Office of Naval Research and the U. S. Atomic Energy Commission.

## THE VALIDITY OF THE ISOTOPIC SPIN QUANTUM NUMBER FOR LIGHT NUCLEI

(Publication No. 13,706)

William M. MacDonald, Ph.D.  
Princeton University, 1955

The validity of the isotopic spin quantum number, which exists for charge independent nuclear forces, is affected only by the Coulomb potential. Unless charge independence is to be renounced, it must be possible to attribute violations of certain isotopic spin selection rules on nuclear reactions solely to the effect of the Coulomb potential in mixing states of different isotopic spin.

The isotopic spin impurity can be considered to arise in two ways: (1) through perturbation of the wave functions of nucleons in open shells by their Coulomb interaction with each other and with the field produced by protons in closed shells, and (2) through perturbation of the wave functions of nucleons in closed shells by their mutual interaction. The second effect, termed the "core impurity," has been neglected in previous work by L. A. Radicati. But a simple calculation using plane waves to represent the nuclear states (statistical model) gives a much larger figure for the core impurity than that which Radicati found for the impurity of the state of nucleons in open shells.

Calculations of both types of impurity are then made using the jj coupling model of M. Mayer and harmonic oscillator wave functions. An understanding is obtained of the operation of the Coulomb potential in introducing isotopic spin impurity into the states of two and three nucleons in an open shell by studying the mixing of states of the representative configurations  $(1p_{3/2})^2$ ,  $(1p_{1/2})^2$ , and  $(1p_{3/2})^3$  to other low-lying states. The impurities of these states are found to be even smaller than the results of

Radicati. The principal reason for the difference lies in our use of the  $r^2$  potential produced by a uniform sphere of charge rather than the singular  $(1/r)$  core potential of Radicati. A general formula is derived for the equivalent potential produced by nucleons in closed jj shells when the field arises from scalar, spin independent, two-body potential. For the specific case of the Coulomb interaction one obtains an equivalent core potential which differs very little from that produced by a uniform sphere of charge.

The core impurity for the nucleons in closed jj shells can then be calculated in terms of the two-particle matrix elements which were just found. The figure obtained for the isotopic spin impurity of  $C^{12}$  is in excellent agreement with the simple statistical model calculation and confirms the predominance of this core impurity over the impurity of states of nucleons in open shells. One can conclude in fact that only the isotopic spin impurity of the core need be considered to be present in nuclear states until quite high excitations are reached.

An isotopic spin selection rule on electric dipole transitions provides a basis for the actual experimental determination of isotopic spin impurity provided that one can predict uninhibited El widths with sufficient reliability. A discussion is presented of the effects which produce variations in El matrix elements and the conclusion is reached that these effects are not important in light nuclei ( $A \leq 20$ ) at moderate excitation energies ( $< 15$  Mev). Consequently the limits on isotopic spin impurity determined experimentally by Wilkinson and collaborators from the El selection rule are approximately correct. These limits are easily explained by the presence of the Coulomb interaction.

Higher order correction terms to the El selection rule are also calculated and found to be  $\sim 1000$  times less effective than isotopic spin impurity in promoting forbidden transitions. In the course of the calculation formulas are derived for the exact quantum mechanical transition probabilities for radiation of any multipolarity.

Finally the isotopic spin selection rule on  $\beta$ -decay is studied, but one can show that no violations of the selection rule are likely to be found in light nuclei. The effect of the isotopic spin impurity on the Fermi coupling constant derived from  $0^+ \rightarrow 0^+$  transitions is shown to be just beyond the present limits of experimental accuracy.

175 pages. \$2.19. Mic 56-230

## MESON PRODUCTION IN MESON-NUCLEON COLLISIONS

(Publication No. 15,419)

Mark Samuel Nelkin, Ph.D.  
Cornell University, 1955

The cross section for the production of a single additional meson in meson-nucleon collisions is calculated. The charge symmetric pseudo-scalar meson-nucleon interaction is used in the Tamm-Dancoff approximation neglecting the amplitudes of all states containing more than two mesons. The results are presented by giving the ratio of production cross section to scattering cross section for an incident state of fixed energy, angular momentum, parity and isotopic spin. This ratio can be



obtained in two ways which appear at first sight to be quite different, but which are shown to be identical. The production cross section can be calculated directly by first obtaining the production matrix element, squaring it and integrating over the available phase space. Alternatively the reactive effects of meson production on the scattering can be expressed in the form of an integral equation whose solution gives the complex scattering phase shift. An explicit proof is given that these two methods give identical results in the physical approximation employed. The production to scattering ratio is evaluated numerically for S, P and D states for energies ranging from 270 Mev to 1.4 Bev. The results at the higher energies are not reliable. The ratio of the production to scattering cross sections averaged over angular momentum states for isotopic spin  $3/2$  is given numerically by

|  |        |       |       |       |       |       |
|--|--------|-------|-------|-------|-------|-------|
| Center of mass<br>momentum<br>nucleon mass             | 0.3    | 0.4   | 0.5   | 0.6   | 0.7   | 0.8   |
| Meson kinetic<br>energy in<br>laboratory (Mev)         | 270    | 435   | 630   | 870   | 1,130 | 1,430 |
| Ratio of production<br>to scattering<br>cross sections | .00051 | .0065 | .0215 | .0497 | .0742 | .0947 |

A discussion is given of the inadequacies of the approximations used at energies very near threshold, and at high energies. A quantitative estimate is made of the production cross section very near threshold.

The experimental information that is available indicates that the ratio of production to scattering is considerably greater than has been calculated here. This discrepancy is probably due to the omission of final state scattering through three-meson intermediate states. The total available experimental information consists of:

One meson production even among 150 elastic scatterings observed by Marguiles at Brookhaven for 300 Mev  $\Pi^+$  interactions in hydrogen. (R. S. Marguiles, Private Communication.)

A derived ratio of meson production to elastic scattering of 0.14 from an analysis of 500 Mev  $\Pi^-$  interactions in photographic emulsions. (M. Blau and Martin Caulton, Phys. Rev. 96, 150, 1954.)

A study of the interactions of 1.4 Bev  $\Pi^-$  mesons with hydrogen which indicates that  $2/3$  of the interactions lead to the production of at least one meson, and that  $1/5$  of these are two-meson-production events. (Eisberg et al. Phys. Rev. 97, 797, 1955.) 66 pages. \$1.00. Mic 56-231

# AN ANALYSIS OF THE ROLE OF THE ANOMALOUS MAGNETIC MOMENT IN SPECIFIC CASES OF ELECTRON-ELECTRON AND NUCLEON-NUCLEON SCATTERING BY AN APPLICATION OF MØLLER'S CORRESPONDENCE METHOD

(Publication No. 14,999)

Frank R. Woods, Ph.D.  
New York University, 1955

Adviser: Robert P. Hatcher

It has been known for some time that the anomalous magnetic moments of protons and neutrons can account for small observed differences between non-Coulomb neutron-proton and proton-proton interactions. An investigation of the consequence of these magnetic forces on the differential cross section for neutron-proton, proton-proton and in a similar manner for electron-electron scattering of an unpolarized beam and the development of a completely Lorentz and gauge invariant interaction Hamiltonian leading to the calculation of these cross sections were the objectives of this thesis.

The anomalous moment of the first particle of the interaction was introduced through the addition of the Pauli term to the Dirac wave equation while the anomalous moment of the second particle was accounted for through the Coulomb vector and scalar potentials of that particle appearing in the Hamiltonian. The probability transition matrices for scattering were then obtained by the application of Møller's Correspondence Method. These results were used to derive the differential cross section for electron-electron scattering in the extreme relativistic limit, and neutron-proton, and proton-proton scattering in energy range of about 50 to 100 Mev.

In all these cases it was found that the anomalous magnetic moments had negligible effect on the differential scattering cross section to the first Born approximation.

94 pages. \$1.18. Mic 56-232



## PHYSIOLOGY

### FACTORS CONCERNED WITH CALCIUM METABOLISM IN THE FOWL

(Publication No. 15,295)

Philip D. Bogdonoff, Jr., Ph.D.  
University of Maryland, 1955

Supervisor: Dr. C. S. Shaffner

Penicillin, aureomycin, bacitracin, terramycin and arsonic acid were fed to New Hampshire hens to study their effect on body weight, specific gravity and blood calcium during periods of high environmental temperatures. Data indicate that antibiotics tend to increase blood calcium and egg weight slightly but do not appreciably affect specific gravity. Similar studies conducted with pullets at the beginning of their production year showed slight blood calcium increments following antibiotic supplementation. Results were negative for antibiotic effects on egg weight and specific gravity. Environmental temperature effects were also absent.

A reduction in specific gravity of eggs was observed among hens fed diets suboptimal in calcium during hot weather. Free-choice calcium or antibiotics added to adequate diets did not offset the normal seasonal decline in egg shell quality.

Chick studies were designed to study the role of antibiotics on calcium metabolism. Results showed a general blood calcium increase when antibiotics were added. Also, calcium levels affected both body weights and bone calcification. Utilization of calcium was noted to be better in the presence of antibiotics than in their absence when measured by the chromic oxide method of measuring calcium balance.

New Hampshire chicks reared in three different temperature environments and treated with a variety of hormones elicited inconclusive data with respect to blood calcium. The hot rearing temperature (above 108°F) adversely influenced chick body weights and, also, showed a trend toward depressing the blood calcium. On the other hand, chicks reared at lower than normal temperatures had greater body weights at four weeks of age than comparable groups reared according to accepted practices.

88 pages. \$1.10. Mic 56-233

### A STUDY OF THE FACTORS INVOLVED IN THE EOSINOPENIA OF THE ADRENALECTOMIZED DOG

(Publication No. 13,688)

Milton Eisler, Ph.D.  
Princeton University, 1955

A marked eosinopenia can be readily induced in adrenalectomized dogs by a variety of drugs when these are

administered intravenously or intramuscularly in doses sufficient to elicit toxic reactions. The stress-induced decrease in eosinophils following injections of histamine, epinephrine, compound No. 48-80 (a histamine liberator), pituitrin, and regitine is prevented by adequate foretreatment with the antihistaminic agent, pyribenzamine. It was observed that many of the toxic symptoms exhibited by the dogs following injection of the various drugs were greatly ameliorated or prevented entirely by the antihistaminic, pyribenzamine.

Pyribenzamine in the dosage employed in these experiments, was non-toxic and did not induce eosinopenia. It was ineffective in preventing the profound fall in eosinophils induced by cortisone.

Adrenalectomized dogs exhibit a true physiological diurnal variation in the numbers of eosinophils during the day. It is shown that this diurnal rhythm is independent of the induced eosinopenia.

It is suggested that the stress-induced eosinopenia of the dog lacking adrenals is due to the histamine releasing action of the drugs when these are given in toxic doses. The actual eosinopenic agent is considered to be histamine, and not the drug that liberated it.

94 pages. \$1.18. Mic 56-234

### EFFECT OF GLYCEROL IN PROTECTING TISSUE HOMOGENATES AGAINST THE EFFECTS OF FREEZING

(Publication No. 15,450)

Kenneth Keith Faulkner, Ph.D.  
The University of Oklahoma, 1955

This study was concerned with the influence which glycerol exerts on the oxygen consumption of fresh and frozen tissue homogenates under various experimental conditions.

The Warburg modification of the Barcroft apparatus and applied manometric techniques were employed. Rat and rabbit brain homogenates were prepared and oxygen consumption measurements after various treatments were made. "Mitochondrial preparations" were also made and oxygen consumption of the alpha-ketoglutaric oxidase and succinoxidase systems was measured as well as concurrent phosphorylation.

Oxygen consumption of rat brain homogenates is lowered by 50 to 80 per cent by the process of freezing and thawing. Tissue chunks which have been treated with various concentrations of glycerol, frozen, thawed, and homogenized consume oxygen at the same rate as do the untreated frozen homogenates. If 10 per cent glycerol is added to the homogenate before freezing to -79°C., oxygen consumption after thawing is equal to that of fresh homogenate preparations containing 10 per cent glycerol.

Glycerol has no significant effect on the oxygen consumption of fresh homogenates in concentrations less than 15 per cent. The oxygen consumption of frozen homogenates containing 15 per cent glycerol is less than that of the fresh homogenates containing the same concentration of glycerol. The oxygen consumption of both frozen and fresh homogenates containing 15 per cent glycerol is considerably less than that of the fresh homogenates containing no glycerol.

No appreciable period of equilibration is needed to permit the glycerol to permeate the cellular components of the homogenates. However, the ionic content of the reaction media must be considered. Oxygen is consumed at a more sustained and rapid rate by both fresh and frozen homogenates if the ionic content is maintained.

Glycerol appears to preserve tissue homogenates for as long as 28 days without any apparent loss of enzymatic activity, if oxygen consumption is used as a criterion. Rat brain homogenates prepared in glycerol-Krebs-Ringer-phosphate buffer solutions of 5 per cent, 10 per cent, and 15 per cent glycerol were frozen at  $-79^{\circ}$  C. for one day, 14 days, and 28 days. Oxygen consumption of homogenates frozen in 5 per cent glycerol was approximately the same for all time periods of freezing. The same is true of the homogenates frozen in 10 per cent glycerol and 15 per cent glycerol.

There is a decrease of oxygen consumption of rat brain homogenates containing 15 per cent glycerol when frozen and then diluted to 7.5 per cent or to 3.0 per cent glycerol for oxygen consumption measurements. Neither rapid dilution nor rapid addition of glycerol can be said to be totally responsible for the decrease in oxygen consumption caused in homogenates containing glycerol in high concentrations (30 per cent).

The addition of adenosine triphosphate, diphosphopyridine nucleotide, or cytochrome *c* to frozen homogenates of rat brain, either separately or collectively, fails to increase the oxygen consumption above that of the frozen homogenate measured without these additives and without glycerol.

Glycerol appears to inhibit the activity of the alpha-ketoglutaric oxidase system and the succinoxidase system of dilute homogenates and "mitochondrial preparations." However, it appears also partially to protect these systems in the frozen homogenates and "mitochondrial preparations." Freezing seems to inhibit the activity if glycerol is not present.

Glycerol has no significant effect on the oxygen consumption of fresh or frozen rabbit brain homogenates in concentrations up to 15 per cent. Glycerol, in a concentration of 7.5 per cent, appears to protect fully the oxygen consumption of rabbit brain homogenates which have been frozen from one to three days.

66 pages. \$1.00. Mic 56-235

#### A STUDY OF THE EFFECTS PRODUCED BY AN OIL SUSPENSION OF DIGITOXIN ADMINISTERED ORALLY

(Publication No. 15,092)

Sidney Seamore Levin, Ph.D.  
University of Pittsburgh, 1955

The cardiac glycosides have been used for many years in the treatment of heart failure. The only one of the

glycosides that is completely absorbed when administered orally is digitoxin, making it the drug of choice in this case. Cardiac glycosides are not specific in their distribution so that not only are they found in the myocardium but also in skeletal muscle and in soft organs of the body. It had been demonstrated that previously stained oil could be traced histologically through the body and into the various tissues including the myocardium. If an oil suspension of the digitoxin could be prepared, then perhaps there would be enhanced action of the drug on the myocardium and conduction system resulting in smaller doses and elimination of undesirable side effects. This problem was undertaken to test this hypothesis.

A series of 12 cats was used in this work, seven of which were fed the stained olive oil suspension of digitoxin, the rest receiving a 49 per cent hydroalcoholic solution of the glycoside. A normal electrocardium was taken for each animal prior to the feeding, then electrocardiograms were taken until leveling or depression of the T wave was noted. If the animal survived, then a second partial dose was given and the changes again observed. This procedure was repeated until the animal expired. The heart was then excised and fixed in a ten per cent pyridine formaldehyde solution.

It was noted that a longer period of time was required for the suspension to depress or invert the T wave than for the hydroalcoholic solution. The appearance of a maximal effect was also delayed in the oil suspension. Along with the delay was a prolonged maximal effect of the drug.

Microscopic study of the sections of the excised hearts revealed a high amount of stained oil in the myocardium. This contrasted sharply with little if any oil in the hearts of animals fed the hydroalcoholic solution.

This side effect, of emesis, which is produced by cardiac glycoside intoxication was diminished although not eliminated in animals receiving the oil digitoxin suspension. The emetic effect is due to central nervous system stimulation as well as to local gastric irritation. Some straited muscle twitch was observed in the animal.

Changes on the electrocardiographs on the oil-suspension-fed animal indicate that a smaller dose could be administered with longer lasting effect than in the hydroalcoholic solution. This would make possible smaller doses and a decrease of some of the side effects of the drug.

63 pages. \$1.00. Mic 56-236



## POLITICAL SCIENCE

### POLITICAL SCIENCE, GENERAL

#### THE FARM SECURITY ADMINISTRATION: A STUDY IN POLITICS AND ADMINISTRATION

(Publication No. 15,044)

Sidney Baldwin, Ph.D.  
Syracuse University, 1955

In recent years, the study of public administration has been liberated from a relatively narrow concern with description of administrative structure and procedure, and political scientists have begun to explore the political aspects of public administration. Adequate concepts of the broad political process through which public policies are formulated and administered have not yet been sufficiently developed, tested, and refined, however. To do so, it seems necessary and fruitful to analyse the inter-relationships between the instrumentalities of government and the environmental forces with which governments must cope. Politics and administration thus seem to offer a rich area for research into American political behavior. The experience of the Farm Security Administration furnishes fruitful data for such a study.

This study is an analysis of the political and administrative forces involved in the development and decline of the Farm Security Administration through a period of over twelve years. It includes a step-by-step analysis of the legislative process through which a major piece of legislation was enacted by the Congress, and the subsequent process of congressional reexamination and adjustment. This study also includes a detailed analysis of the pattern of administrative behavior in response to the various political and administrative forces at work. The focus of the study is thus on the relationships between the legislative and executive aspects of the agency's rise and decline, on the relationships between the agency and its social context, and between the institutions of government.

The writer has spent almost two years in various parts of the United States, interviewing many of the leading participants in the events discussed here and in examining a variety of materials which cast light on the politics and administration of the agency. Research has been conducted in many varied places — official files of government agencies, government archives, public and private libraries, personal correspondence files and diaries, government studies and reports.

The central proposition of the study is that the political involvement of public administration renders an administrative agency and its programs vulnerable to conflicts in the environment, and that the necessities of survival demand continual adaptation.

The study reveals that the adaptive process through which an administrative agency may resist forces of dissolution, and adjust to conflicts and changes in social context may assume a cyclical pattern, characterized by different programmatic, organizational, and procedural factors. The

experience of the agency suggests that there may be inevitable change in an agency's social role, administrative vitality, and political viability.

Another conclusion that emerges is that the available alternatives for a public administrator, faced with a dual concern for both programmatic success and the survival of the agency, are not limited to either abject submission or stubborn resistance. There are dangers in both of these courses, but there are times when resistance is both necessary and justified. If an agency is to resist at all, however, it must develop a broad measure of support among the politically operating people. Administrative survival seems to depend, in large part, on an agency's capacity to remain close to the prevailing political climate without being dominated by it, to broaden the channels of communication between politicians and administrators and to exploit latent public understanding, good will, and support.

Finally, this study reveals the manner in which public policy controversies may be fought in distorted terms that bear little resemblance to the real issues involved.

625 pages. \$7.81. Mic 56-237

#### THE POWER POSITION OF THE COOK COUNTY DELEGATION IN THE ILLINOIS GENERAL ASSEMBLY, 1949-1953, AS TESTED BY ROLL-CALL VOTES AND COMMITTEE POSITIONS

(Publication No. 15,127)

David Richard Derge, Jr., Ph.D.  
Northwestern University, 1955

Using roll-call votes and committee positions as indices, this study examines the victories and defeats of the delegation from Cook County, the largest urban area in the state of Illinois, in a legislature which was numerically dominated by non-Cook County ("downstate") legislators.

On the basis of findings cited below, the author concluded that on contested roll-call votes there was little conflict between Cook County and downstate delegations, that the Cook County delegation did not regularly vote with a high cohesion, and that when the Cook County delegation did vote with a high cohesion it was seldom defeated by the downstate delegation. The success of the Cook County legislators in capturing committee chairmanships shows that these legislators are not discriminated against, and that they do relatively better in the distribution of these positions than do their downstate colleagues. These conclusions are not in keeping with the widely held belief that the Cook County delegation is helpless in the face of a legislature numerically controlled by downstate legislators.

During the 1949, 1951 and 1953 sessions, there were 3,657 House roll-calls and 3,898 Senate roll-calls. Of these 7,555 roll-calls, 401 in the House and 351 in the Senate were identified as "contested." On each of these,



at least 14% of the total membership of the chamber voted on the losing side.

The Cook County House delegation voted with a cohesion of 67% or more on 95 of the 401 contested roll-calls, and the Cook County Senate delegation voted with a cohesion of 67% or more on 94 of the 351 contested roll-calls. There were four roll-call defeats of the Cook County House delegation when it voted with a cohesion of 67% or more, and twenty three roll-call defeats of the Cook County Senate delegation when it voted with this cohesion.

There was little Cook County-downstate conflict on roll-calls. On three of the 7,555 roll-calls, 80% or more of the Cook County delegation opposed 80% or more of the downstate delegation. There were six roll-calls on which 67% or more of the Cook County delegation opposed 67% or more of the downstate delegation, while there were 183 roll-calls on which 67% or more of the Democrats opposed 67% or more of the Republicans.

The chi-square test indicated that in the distribution of winning and losing votes party affiliation exerted a much stronger influence than did geographical location of the legislator's district. High downstate opposition to the Cook County delegation came from Republican legislators from the north-central and northwest districts of the state. Downstate legislators from districts over half of which were made up of urbanized areas, were distinguished neither for high support nor high opposition to the Cook County delegation.

Cook County legislators chaired or numerically controlled a majority of the important standing committees dealing with legislation in the House, and a minority of these committees in the Senate, although a Cook County Senator chaired the committee which was responsible for the reference of bills to standing committees.

In both chambers during the three sessions, a higher percentage of Cook County legislators who belonged to the party controlling the chamber were given chairmanships than was the case with downstate legislators who belonged to the party controlling the chamber. In the three House sessions, a higher percentage of the whole Cook County delegation received chairmanships than did the downstate delegation, although in all three sessions of the House there were fewer Cook County legislators of the majority party than there were downstate legislators of the majority party.

266 pages. \$3.33. Mic 56-238

#### THE POLITICAL DEVELOPMENT OF THE FRENCH OVERSEAS EMPIRE

(Publication No. 15,374)

George H. Kelly, Ph.D.  
Stanford University, 1955

Major Professor: Graham H. Stuart

This work examines the political development of the French overseas empire from its beginning in the seventeenth century until the present time. It traces the changing motives for overseas expansion and the major variations in colonial policy under the succeeding regimes in France during that period. Particular attention is paid to: the evolution of the colonial legislative system, the growth of suffrage and civil rights, the changes in the concept of citizenship, and the development of overseas representative councils and assemblies. The major overseas political reforms effected

by the Constitution of the Fourth Republic and by recent French legislation are described in detail. In the second half of the work, each overseas department, territory, and protectorate is examined separately. Its major political problems are discussed, together with the structure and operation of its governmental machinery and the political attitudes of the inhabitants. The aims of the various indigenous nationalist movements, their composition, the conditions favoring their appearance, and the results of their activities are explained. The nationalist movements of North Africa and Indo-China are described in particular detail.

In conclusion, an attempt is made to analyze the major differences lying between the overseas indigenous populations, the French colonists, and the population of Metropolitan France; and the possibilities of resolving these differences are appraised.

1226 pages. \$15.33. Mic 56-239

#### POLITICAL SCIENCE, GENERAL

##### CHIEFTAINSHIP AND LOCAL GOVERNMENT IN TANGANYIKA: A STUDY OF INSTITUTIONAL ADAPTATION

(Publication No. 15,143)

J. Gus Liebenow, Jr., Ph.D.  
Northwestern University, 1955

This study has been focused upon the efforts of the British Administration in Tanganyika to utilize indigenous authority systems as vehicles for administration at the local level. Two primary questions have been posed: (1) has the utilization of the indigenous system actually been in accord with the traditional expectations regarding the performance of the system? and (2) has the real or putative use of the indigenous authorities been "successful" in the accomplishment of the goals of the British with regard to the provision of modern services of government?

Two of the 120 tribal groupings of Tanganyika, the Wachagga and the Wasukuma, were selected for concentrated study. Common features of the traditional authority systems of the Wachagga, the Wasukuma, and several other tribes of Tanganyika are the following: chieftainship has been hereditary; there has been a variety of chieftaincy roles in connection with law, warfare, the economy, and magico-religious performances; other institutions, not predominantly political, have been concerned with the performance of political functions; and political authority within the tribe has been proliferated among a series of multiple chiefdoms.

For the purpose of analyzing the transformations taking place in the traditional political systems of Tanganyika, the inter-action of Africans, Europeans, and Asians has been viewed as taking place within a situation of political dependency. This is a relationship structure in which individuals and groups associated with one society (in this case the British, and the preceding German, societies) have been able to make alterations in the authority system of a second society (the individual tribal societies of Tanganyika). To aid in the comparison of the Tanganyika situation with other situations of political dependency, the character of the relationship has been



made explicit with regard to a number of items: the manner in which the relationship was initiated; the manner in which it has been sustained; the membership groupings of both the "superior" and the "subordinate" societies actually involved; the goals of the relationship from the standpoint of one or both sides; and the manner in which the goals are implemented.

The means employed by the British Administration in introducing local social and economic services and in altering existing political values has commonly been referred to as a policy of "Indirect Rule" or "Indirect Administration." These terms, which refer to the intention of utilizing indigenous authorities as agencies for administrations, are lacking in precision. It is the contention of this study that the utilization of native institutions is limited by a number of factors. These factors fall into six analytic categories: (1) cognition by the "superior" component of the actual, rather than the putative, traditional authority system; (2) adaptability of the native institutions to the new set of goals; (3) the character of the agents of the "superior" component (that is, the number and types of agents); (4) the emotional content of the relationship; (5) the natural and social environment; and (6) the unplanned responses on the part of the "subordinate" society to the situation of political dependency.

While each of these factors has been significant in suggesting why the response of the Wachagga to the goals of the British Administration has been more "successful" than that of the Wasukuma, the last named category appears to be of greatest portent vis-à-vis the continued utilization of indigenous authorities. The unplanned responses on the part of the Africans have been manifest in a series of ambivalent reactions: respect for hereditary privilege versus respect for the achievement of the individual; chieftdom or tribal parochialism versus cosmopolitanism of Territorial or East African scope; friendliness versus hostility towards Europeans and Asians; and individualism versus group solidarity. While the tribal situations in Tanganyika are in many respects *sui generis*, the emergence of popular economic and political groupings enables one to fit the Wachagga and the Wasukuma into a general pattern covering developments in other parts of the African continent.

The material presented in this dissertation has been gathered during a twelve-month field study in various areas of Tanganyika. Documentation has been drawn from personal interviews with administrative officials, chiefs, missionaries, Asian merchants, and other persons concerned with the operations of local government. Numerous administrative committees and local government councils at various levels were attended by the researcher. Published documents of the United Kingdom and Tanganyika Governments were utilized as were administrative records, diaries of chiefs, and other materials available only in the field. For accounts of the traditional authority systems, reliance was placed upon the writings of anthropologists, missionaries, early travellers, and administrative officials. This was supplemented by information provided by chiefs and tribal elders.

405 pages. \$5.06. Mic 56-241

## POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

### THE DEVELOPMENT AND OPERATION OF THE METHOD OF SUPERVISION IN THE UNITED NATIONS TRUSTEESHIP SYSTEM

(Publication No. 14,991)

Lu-Yu Kiang, Ph.D.  
New York University, 1955

Adviser: Waldo Chamberlin

The United Nations trusteeship system is generally recognized not only as a continuation of, but also an improvement over the League of Nations mandate system. This opinion is based primarily on the Charter provisions on trusteeship which gave the principal supervisory organs, the General Assembly and the Trusteeship Council, greater powers and broader functions than the League's Council or Mandates Commission. Two important methods of supervision are wider in scope and stricter in application; review of the annual reports of the administering authorities, and consideration of petitions. One entirely new method has been added; the visiting missions to trust territories. Upon the effective carrying out of these methods of supervision depends the success of the operation of the trusteeship system.

During the preparation and drafting of the Charter first in the United States Department of State and later at the San Francisco Conference, attention centered on such basic questions as the scope of the system and its objectives. But when the United Nations General Assembly was asked to approve the first group of trusteeship agreements in 1946, and the Trusteeship Council adopted its Rules of Procedure in 1947, the debates focused, for the most part, on those issues closely related to the supervisory role; the obligations of the administering authorities; and the implementation of the various methods of supervision. To cite a few examples, some non-administering states advocated a broader interpretation of the phrase "states directly concerned", with the intention of obtaining a greater voice in the approval of such agreements and their subsequent amendment. The mandatories contended that this would result in giving every Member a veto right over the agreements. On the other hand, the administering states proposed for insertion in the Council's Rules of Procedure various rigid restrictions on the acceptability of petitions, which were attacked by the non-administering members as depriving the Council of the effective use of one of its supervisory methods. This is indicative of the type of arguments between the administering and non-administering states on how the system of international supervision should be best operated.

There are now eleven territories in the trusteeship system, one of them being a strategic trust area whose terms of agreement were approved by the Security Council. The agreement for Italian Somaliland was unique in that a United Nations Advisory Council was created to function in the territory as a "field agent" of the Trusteeship Council. No territory has been placed under the direct administration of the United Nations, mainly for two reasons; because the Organization, during its formative years, lacked qualified personnel to undertake such a task, and because the "cold war" made it impossible to secure agreement among major powers concerning the establishment of a direct United Nations trusteeship.

During the first six years of its existence, the Trusteeship Council has considered almost at every session pro-



posals designed to enable it to exercise more effectively its supervisory functions. Among the notable results were the following; the Questionnaire was revised, with questions more precisely phrased and more systematically arranged; a number of time-schedules for the examination of administering authorities' annual reports were devised and tried, all with a view to reducing the time lag between the conclusion of the year covered by the reports and their examination by the Council; a Standing Committee on Petitions was established to help the Council handle the increasing number of petitions received; and the terms of reference of visiting missions were modified to enable them to devote more attention to specific problems and less to making general surveys.

Some of these measures were taken on the Council's own initiative, while others were adopted upon the Assembly's recommendations. Not all of the latter, however, were acted upon promptly by the Council, which frequently led to extended debates between the administering and non-administering states over the issue of the respective trusteeship functions of the Assembly and the Council. The administering powers insisted that the Council was not created to be a mere rubber-stamp of the Assembly, while the non-administering states were critical of, and dissatisfied with the inability of the Council to reach decisions because of its peculiar voting procedure. The recent tendency in the Assembly has been to assert its role more actively by taking some of the trusteeship matters into its own hands and adopting resolutions thereon. This, in the opinion of some observers, was an attempt to by-pass the Council.

The participation of the Security Council in matters relating to the strategic trust territory of the Pacific Islands has not been active. It delegated the Trusteeship Council on its behalf the supervisory functions set forth in the Charter and incorporated in the agreement.

The Economic and Social Council and the specialized agencies, though not supervisory organs, have not infrequently rendered assistance to the Trusteeship Council, either at the request of the latter or on their own initiative. The Secretariat has also played an important role in shaping the operation of the trusteeship system through the drafting of reports, preparation of studies, etc., for the principal supervisory organs.

472 pages. \$5.90. Mic 56-240

#### POLITICAL SCIENCE, PUBLIC ADMINISTRATION

##### A CRITICAL REVIEW OF MODERN ADMINISTRATIVE PRACTICES RELATED TO THE CADET STORE AT WEST POINT

(Publication No. 15,069)

Richard Joseph Stillman, D.P.A.  
Syracuse University, 1955

#### STATEMENT OF THE PROBLEM:

The government enterprise under examination, the Cadet Store, located at West Point, New York, performs manufacturing and retailing functions in consonance with an Act of Congress enacted in 1876. An analysis is made of the administrative practices pertinent to this military enterprise situated at the United States Military Academy. This analysis is projected against expert approved criteria. A summary of the findings reflects an effort: 1) to bring Cadet Store practices into better conformity with established

criteria; 2) to present general observations which may be useful in parallel situations in public and private administration; 3) to recommend changes in military management practices to increase effectiveness and efficiency.

#### PROCEDURES OR METHODS FOLLOWED:

This dissertation is the outgrowth of ideas and information on the subject of management which were derived from a variety of Army assignments in the past fifteen years including recent experience in charge of a military-operated business. Actual administrative problems with respect to unsatisfactory situations are presented to highlight current vicissitudes. The pragmatic approach is tempered with considerable research in the field of theory which includes the views of certain eminent authorities.

#### MAIN RESULTS AND CONCLUSIONS:

The major management functions of planning, organizing, and controlling are related to this particular activity. Human relations as a subject in administration is treated separately and discussed in connection with pertinent problems.

The manuscript points up areas of military mismanagement with appropriate recommendations to remedy the situation. Stress is placed on the requirement for more able operators and few advisors. The writer is in agreement with authorities such as the recent Army Chief of Staff, General Ridgway, and the Hoover Commission who have illuminated deficiencies in administration. This incompetence is cause for concern, since it is not an isolated instance but prevalent in some areas. Although the solution is not easy, a motivating force is adequate leadership. Responsibility, therefore, rests with the Army authorities to take constructive measures.

The management techniques that are utilized by a small Army enterprise may apply, in considerable degree, to comparable public and private endeavors. Nevertheless, there does not appear to be a rigid set of management principles that are generalized answers for this complex art and highly restricted science of administration. All phases must be tempered with common sense and a keen appreciation of human values. In the sphere of free enterprise, failure is recognized rapidly by the inability to survive. Unfortunately, the test for government usually must be against the whole structure. Since latent weaknesses often can be compensated by strengths elsewhere within the organization, only in a climactic struggle will the pull of inadequacy destroy the entire system.

286 pages. \$3.58. Mic 56-242

##### MANPOWER AND PERSONNEL ADMINISTRATION IN THE DEPARTMENT OF DEFENSE

(Publication No. 15,306)

Russell Paddock Strange, Ph.D.  
University of Maryland, 1955

Supervisor: Professor Franklin L. Burdette

This study is a first attempt at an overview of public manpower and personnel administration as it deals with the national security function of government. It endeavors to contribute to the broad theoretical foundation on which must rest any consistent pattern of administrative institutions. As with most initial efforts, some questions may



be left unanswered, some facts and alternatives may be overlooked, and much detail has been omitted.

This work is not a procedures manual. It is no description of all of the minutiae of manpower and personnel administration. Rather, it is a broad analysis of the personnel system in the Defense Establishment with specific examples and appropriate conclusions. The main concern is not with manpower and personnel administration as an end in itself, but with these functions as an aspect of government. The realm of technique and procedure is left for the method analysts, system engineers, and scientific managers.

The scope of this project is not difficult to comprehend. To begin with, defense personnel administration is related to the society whose ends it serves. Relation to the government which it serves is then established through a consideration of the making of public military policy. A brief view of the organization of the manpower and personnel system

leads to an introduction of the secretaries, admirals, and generals who serve as personnel administrators, and to the people of the Armed Forces. The manpower program and personnel operations are examined and include a special look at specific case materials. Three different types of materials are considered: an interservice analysis of a very limited function for a particular category of personnel, officer efficiency ratings; an interservice comparison of a broader personnel operation, assignment of military personnel; and a brief description of selected administrative actions within a single military department. Reserve and civilian matters are considered only insofar as they help to indicate the scope of administrative activity. Some concluding observations are presented in the last chapter.

487 pages. \$6.09. Mic 56-243

## PSYCHOLOGY

### PSYCHOLOGY, GENERAL

#### A SCALE MEASURING ATTITUDES TOWARD WORKING FOR THE GOVERNMENT

(Publication No. 14,514)

Barbara Phillips Aalto, Ph.D.  
University of Minnesota, 1955

A review of the literature has revealed a lack of valid and reliable measures of attitudes toward working for the government. Such a measure would have many uses in counseling high school and college students, in the selection of workers who would be satisfied with government employment, and research studies of these attitudes and factors affecting them.

The present study was designed to construct such a measure. A total of 109 statements expressing varying opinions about working for the government were collected, edited, and given a preliminary tryout on 173 college students in Laboratory Psychology. Results of this administration showed a wide diversity of opinions and a lack of ambiguity in the items. In addition, 16 items of low discriminating capacity were eliminated, on the basis of the Rundquist-Sletto item scale value difference method. A group of seven items were added to provide more positively stated items that would be discriminating.

The construction and standardization was then extended by administering a 100-item questionnaire to 493 federal government employees and 299 private employees, mainly employed at the professional and managerial level. An item analysis was performed using both an external and an internal criterion. The internal criterion used was the total score on the test. The external criterion was a composite of job status and job satisfaction. The government criterion group consisted of presently employed government workers who met a stated definition of "satisfied with government employment." The private criterion group was composed of employees of private business and industry,

matched for nature and kind of position and likewise satisfied with their jobs. Each criterion group was split to provide a criterion group and a cross-validation group. Items were eliminated that did not differentiate on the basis of all of these criteria at the .01 level, which did not show a scale value difference over .5000 using the Rundquist-Sletto technique, and which were clearly duplications of statements contained in other items.

The Final Scale or Government Employment Attitudes Scale contained 70 items. A reliability coefficient of .96 (corrected by the Spearman-Brown formula) was found for the government sample and .94 (corrected) for the private group. These results indicate that the scale measures with a high degree of consistency.

Several types of evidence were given to show that the scale has validity and does in fact measure attitudes toward government employment. All differences were significant at the .01 level.

1. The criterion group of satisfied government workers differed significantly from the criterion group of satisfied private employees. Furthermore, the differences were of sufficient magnitude to have practical guidance and selection values as shown by the fact that less than one percent of satisfied private employees reached or excelled the mean of satisfied government workers.

2. The cross-validation groups likewise showed statistically significant differences. None of the satisfied private employees in the cross-validation group reached or excelled the mean of satisfied government workers.

3. Satisfied government workers scored significantly higher than unsatisfied workers. Again, the difference was of considerable magnitude.

4. Satisfied private employees scored significantly lower than unsatisfied private workers, but the difference was not as great as in the preceding comparison.

5. Unsatisfied government workers scored much higher than unsatisfied private employees.

6. Workers who gave "federal government" employment first choice on a ranking question scored significantly



higher than those who ranked "private employer" first choice. These differences were also large.

7. A correlation between government Employment Attitudes scores and the Hoppock Job Satisfaction Blank in the government group was +.45. This positive relationship, however, did not hold for the private group. The correlation was -.08 which is not significantly different from zero.

8. The scale items, in addition, appeared to have "face validity."  
273 pages. \$3.41. Mic 56-244

#### THE RELATION OF SOME CONCEPTS OF SALVATION AND PSYCHOTHERAPY

(Publication No. 14,174)

Myron Fred Klinkman, Th.D.  
Boston University School of Theology

Please see abstract on pages 168-169.  
273 pages. \$3.41. Mic 56-245

#### A STUDY OF APPARENT MOVEMENT IN THE THIRD DIMENSION

(Publication No. 14,415)

Ernest Dennison McDaniel, Ph.D.  
Purdue University, 1955

Major Professor: N. C. Kephart

The present study was carried on in connection with efforts to develop an apparatus which might have potential value in measuring the way in which an individual structures visual space.

The purpose of the study is to determine whether reliable individual differences occur in the interpretation of apparent movement in depth. Where such differences occur, an attempt is made to discover whether visual correlates exist for the ability to perceive this movement in depth among the measures yielded by the Bausch and Lomb Ortho-Rater and the Howard-Dolman depth perception test.

A review of the literature indicates that apparent movements in the third dimension have been reported but have received little systematic attention. Individual differences have been noted but investigations of reliabilities and variables are rarely reported.

An apparatus is described which consists of two six volt neon bulbs, alternately activated, mounted on uprights and placed in an alley twenty feet in front of the subject approximately parallel to his line of vision. The distance between the lights may be varied so that an apparent movement in depth becomes progressively easier to perceive.

With this apparatus, marked individual differences were obtained with reliabilities in the nineties. With the possible exception of far point binocular acuity, no relationship was demonstrated between the kind of movement seen in the apparent movement apparatus and the visual measures yielded by the Bausch and Lomb Ortho-Rater or the Howard-Dolman depth perception test.

From these findings, a tentative conclusion is drawn

that factors other than structural are operative in the kind of movement perceived in the apparent movement apparatus for the population studied.

That the general area of personality organization and functioning may be a fruitful field in which to search for determinants of individual differences in the interpretation of this phenomenon is indicated by reports from the literature of impairment of perception in the third dimension in both experimentally induced states of personality disorganization and in clinical cases.

49 pages. \$1.00. Mic 56-246

#### TRAINING NEEDS OF GENERAL FOREMEN AS PERCEIVED BY SELF AND SUBORDINATES

(Publication No. 14,424)

Richard King Rosensteel, Ph.D.  
Purdue University, 1955

Major Professor: C. H. Lawshe

This thesis represents an attempt to measure the training needs of general foremen as they are perceived by general foremen themselves and by their foreman subordinates. The measuring instrument is a training needs checklist developed by a large Midwestern multi-plant manufacturing concern and consists of seven relatively independent areas of training, each scored separately. There are two forms of this checklist: one with which the general foreman describes his own training needs, and a second with which the foreman subordinates describe the needs of their general foreman superiors.

Procedure. For this thesis the data from 276 subordinate (foreman) and 76 self (general foreman) checklist forms of two plants were analyzed. Since the assumption of normality required in analysis of variance could not be met, a non-parametric technique known as the Kruskal-Wallis H-test was used. The first comparison of importance to this study was the comparison between training needs of the general foremen as perceived by self and as perceived by subordinates. Production and service general foremen were compared on their training needs. In one plant the relationship between job performance and training needs was investigated, while in another plant the relationship between management attitude and training needs was tested. The amount of agreement among general foremen and foremen's perceptions of the general foremen's training needs was measured with another non-parametric statistic, Kendall's coefficient of concordance. The independence of the seven areas was examined by testing whether scores on the areas differed statistically from one another.

Results. In every case where a statistically significant difference was found, general foremen themselves felt that they needed more training than their subordinates felt they (the general foremen) needed. In the few cases where significant differences occurred, foremen under production general foremen thought their immediate superiors needed more training than their counterparts in service departments. Neither job performance nor management attitude was found to relate to training needs. All general foremen in Plant L as a group perceived their greatest need for



training in Technical Job Knowledge, and their least need for Subordinate Relations training. General foremen as a group in Plant S, on the other hand, feel they need training most in Labor Relations and least in Personal Development. However, these findings are tempered by the fact that in general there was very low agreement among individual general foremen and foremen in the way they ranked these training need areas.

**Discussion.** Although not tested by the design of this study, it is suggested that perhaps general foremen are more aware of their own shortcomings and therefore are more critical of themselves. Hence they perceive their own needs as greater than they are perceived by their subordinates. Possible inadequacies of the ratings used to measure job performance were discussed in relation to the failure to find a relationship between job performance and training needs.

Since relatively little agreement was found among general foremen and foremen in the way they perceived the general foreman's training needs, it is planned that a training needs checklist specific to Plant L's operation be developed. This would be used on an identified basis to complement the techniques already being used in their Management Development Plan.

81 pages. \$1.01. Mic 56-247

#### THE EFFECT OF FILM-MEDIATED FANTASY AGGRESSION ON STRENGTH OF AGGRESSIVE DRIVE IN YOUNG CHILDREN

(Publication No. 15,385)

Alberta Engvall Siegel, Ph.D.  
Stanford University, 1955

In their conception of the dynamics of aggression, behavior theorists have adopted the "catharsis" notion employed by Freud, asserting that the expression of any act of aggression is a catharsis that reduces the instigation to all other acts of aggression. This assertion, the hypothesis of equivalence of forms, would predict that the effect of film-mediated fantasy aggression is to reduce subsequent instigation to aggression.

To test that hypothesis, the play of young children after two different short animated-cartoon films was compared. One film, the E film, concentrated on a theme of interpersonal aggression. The other, the C film, had no aggression in its content. These two films were equated in interest for the young children. The presumption that the E film mediated fantasy aggression is supported by the finding that the children showed significantly ( $P < .00002$ ) more anxiety during the showing of the E film than during the showing of the C film. Twenty-four children (participating in like-sexed pairs) saw the two films at two different sessions, half seeing the E film at session I and half seeing the C film at session I. After each film showing, the two children were left alone together in a playroom, and their play was observed through a one-way vision mirror for fourteen minutes. Observers scored the play for incidence and degree of aggression, and for incidence and degree of anxiety and guilt. The observers showed close agreement ( $r = .97$ ) in scoring aggression, and acceptable agreement ( $r = .77$ ) in scoring anxiety and guilt. Both sets of scores were considered indices to strength of aggressive drive, and intervening variable.

Analysis revealed that the children's scores on these two indices in the E sessions were not significantly different from their scores in the C sessions. Thus the null hypothesis was accepted.

In a comparison of session I with session II, it was found that the children showed significantly ( $P < .05$ ) more aggression and significantly ( $P < .01$ ) more anxiety and guilt in session I than in session II. For both sessions combined, boys showed significantly ( $P < .0002$ ) more aggression than girls, and significantly ( $P < .05$ ) more anxiety and guilt than girls. For both sessions combined, the correlation between aggression scores and anxiety and guilt scores was,  $r = .30$  ( $P < .05$ ). The correlations of the children's aggression scores (for both sessions combined) with two sets of teachers' ratings of the children's habits of aggression were,  $\rho = .68$  ( $P < .002$ ) and  $\rho = .56$  ( $P < .02$ ).

Inasmuch as the scores for aggression and for anxiety and guilt discriminated between sessions and between sexes, were reliable, and correlated with teachers' ratings, the acceptance of the null hypothesis with respect to the predictions derived from the hypothesis of equivalence of forms could not be attributed on insensitivity of the measurement. However, the appropriateness of the measurement is open to some question, inasmuch as the aggression scores seem to reflect strength of habits of aggression rather than strength of aggressive drive, and the anxiety and guilt scores may be inadequate indices of strength of aggression anxiety (and thus of strength of aggressive drive). Moreover, more intense film stimulation than was used in this study may be required to produce an experience of fantasy aggression which is sufficient for a fair test of the hypothesis of equivalence of forms. Finally, the use of drive-produced aggression rather than situationally-aroused aggression may have been premature in a test hypothesis of equivalence of forms. These considerations suggest the need for specified kinds of future research.

149 pages. \$1.86. Mic 56-248

#### PSYCHOLOGY, CLINICAL

##### VERBAL ROTE LEARNING IN SCHIZOPHRENIC AND NORMAL SUBJECTS

(Publication No. 15,120)

Ellen Yen Yee Ahana, Ph.D.  
Northwestern University, 1955

Supervisor: Janet A. Tayler

The present study was designed to compare the performance of schizophrenic and normal Ss on a verbal learning task under ordinary conditions and under conditions in which irrelevant distractor elements were present during learning, the latter being introduced with the expectation that the performance of schizophrenics might show more disruption than that of normals when distractors were present. Finally, an attempt was made to determine whether the groups differed in their later recall of the distractor stimuli, i.e., showed differences in incidental learning.



The schizophrenic and the normal control groups, equated for age, education and IQ, were each subdivided into a distraction and non-distraction group. All Ss were given 15 trials on a serial list of 12 adjectives of high familiarity and a low degree of intra-list similarity. For the distraction groups each adjective in the list was bordered by one of 12 sets of symbols which were absent for the non-distraction groups. Instructions were identical for all groups, in which no reference was made by E to the symbols. Immediately after the learning trials, a test of incidental learning was administered in which S was asked to select from 24 cards the 12 containing the sets of symbols that had been used as borders in the adjective list.

Results indicated that under the usual (non-distraction) conditions, the schizophrenics were significantly inferior to the normals in their performance on the verbal learning task. Under distraction conditions, both the normals and schizophrenics performed at a consistently lower level than the comparable groups learning under non-distraction conditions. Although the schizophrenics were again inferior to the normals, the discrepancy between the two groups under distraction was not greater than the discrepancy under non-distraction conditions. However, when the schizophrenics were divided into acutely ill and convalescent groups on the basis of ward status, it was found that the acutely ill schizophrenics showed a significantly greater inferiority to the normals under distraction than under non-distraction conditions. A comparison of the distraction groups on their ability to recognize which stimuli had been used as the distractors suggested that while some incidental learning had occurred there was no difference between the schizophrenics and normals in their performance on this task.

The tendency of at least the acutely ill schizophrenics to do relatively worse than normals under the distraction condition and qualitative differences between the performance of the patients and normals were consistent with the expectations of the hypothesis that the inferior intellectual performance of schizophrenics may be due in part to their greater distractibility to irrelevant stimuli. The finding that even acutely ill patients did learn and were capable of grasping instructions suggests that the inferior performance of the schizophrenics could not easily be attributed to a loss of intellectual capacity *per se*. The need to consider the degree of pathology and the manner in which distractors are presented was pointed out in suggestions for further research.

70 pages. \$1.00. Mic 56-249

#### A STUDY OF CONCEPTUAL LEARNING BY BRAIN-INJURED PATIENTS

(Publication No. 15,085)

Howard Thomas Bassett, Ph.D.  
University of Pittsburgh, 1955

This study investigated the problem of whether any difference exists between brain-injured and normal subjects in conceptual learning. The relationship between intelligence and conceptual learning and between age and conceptual learning was also evaluated.

The 22 brain-injured subjects were drawn from the Veterans Administration Hospital, Leech Farm Road,

Pittsburgh, Pennsylvania. This group was heterogeneous with regard to type, localization, and extent of injury. Control subjects were selected from the Veterans Administration Hospital, University Drive, Pittsburgh, Pennsylvania and were matched with the brain-injured patients on the basis of age.

Each subject participated in the learning of conceptual discriminations to three series of stimuli. The stimuli were wooden blocks of various shapes, colors, and sizes. The subject was seated before a wooden barrier at the bottom of which was a square aperture, and behind which was a shutter consisting of a vertical sliding door. The experimenter operated the shutter manually, controlling the exposure time of each stimulus. The subject was informed that some of the blocks were "Vec," while others were "Not a Vec." He was required to indicate his choice for a given stimulus presentation by lifting his finger from one of two telegraph keys before him. If his choice was correct, the experimenter said, "Right"; if his choice was incorrect, the experimenter said nothing. It was decided in advance which of the stimuli, i.e., tall blocks, would be "Vec" and which, i.e., short blocks, would be "Not a Vec." Following participation in the learning experiment, each subject was administered the Revised Beta Examination.

Utilizing the nonparametric median test, a nonsignificant difference favoring the control group was obtained on the three series of conceptual learning. There was no discrepancy between the groups on differences between successive learning series. An analysis of conceptual learning as a function of intelligence for both groups combined revealed a nearly significant difference between the upper and lower intelligence categories divided at the median I.Q. of 102. This difference favored the upper intelligence category. The performance of the brain-injured group in the upper intelligence category was less efficient than that of the control group in the same category. The brain-injured group in the lower intelligence category, however, was comparable not only to the control group in that category, but also to the brain-injured group in the upper intelligence category.

The analysis of conceptual learning as a function of age for both groups combined disclosed no significant difference between the upper and lower age categories divided at the median age of 33. However, the major source of difference between the brain-injured and control groups was traced to the upper age category where the control group was slightly more efficient.

These results suggested the following conclusions: (1) Brain-injured patients are not significantly less efficient than normal subjects in the learning of conceptual responses as measured in this study. (2) Brain-injured patients display no disproportionate difficulty in modifying conceptual responses. (3) Impairment of conceptual learning in the brain-injured group is disproportionately greater for patients above I.Q. 102 on the Revised Beta Examination. (4) Impairment of conceptual learning in the brain-injured group is more apparent in patients above age 33.

60 pages. \$1.00. Mic 56-250



**ANXIETY AND INTELLECTUAL CONTROL  
AS RELATED TO INTELLECTUAL PERFORMANCE  
OF PSYCHIATRIC PATIENTS**

(Publication No. 15,372)

William Anton Hunrichs, Ph.D.  
Stanford University, 1955

This study was undertaken to investigate the separate and combined influence of anxiety and intellectual control on selected intellectual tasks. The investigation of the relationship between personality variables and cognitive tasks has increased in scope in recent years concurrent with the development of purportedly more adequate scales to measure personality traits. Unfortunately investigations in this area have frequently yielded conflicting results and have led to invalid generalization of results to groups widely divergent from the original samples. The present study is an attempt to synthesize some of the findings into a reinforcement learning theory framework and to test hypotheses developed on the basis of earlier research on a neuropsychiatric population.

The hypotheses formulated were: (1) that there would be a significant negative relationship between anxiety and intellectual performance, (2) that there would be a significant positive relationship between intellectual control and intellectual performance, and (3) that there would be a significant interaction effect between anxiety and intellectual control on intellectual performance.

Eighty patients newly admitted to a Veterans Administration neuropsychiatric hospital served as subjects for the investigation. Measures of anxiety, intellectual control, general intelligence and intellectual performance were obtained from the subjects by means of standard psychological tests.

None of the three hypotheses of this study was supported when the effect of general intelligence was statistically controlled. The correlations between anxiety and intellectual performance were not significant and dropped to near zero when general intelligence was dropped. Correlations between intellectual control and intellectual performance were significant before general intelligence was partialled out but dropped below significance in the partial correlations. The analysis of the interaction between anxiety and intellectual control, as it affects intellectual performance, indicated no significant interaction effects.

The failure to support any of the hypotheses was considered in terms of sources of error related to the population studied, the measurement techniques, and the limitations of the theory. The chronicity of illness and homogeneity of the sample were considered possible sources of error as were the use of self-report techniques and unreliability of measurement. The possibility that the theory is inapplicable to persons suffering from chronic anxiety was also considered.

It was concluded that for a variety of currently used measures of anxiety and intellectual control, the theory that anxiety will interfere with intellectual performance and intellectual control will facilitate performance is not applicable to a chronic psychiatric population. The present results also indicate the need for controlling general intelligence in studies of the relationship between personality variables and cognitive performance. The feasibility of using self-report techniques with seriously disturbed subjects is questioned.

Research needs in this area of investigation are seen to be in the development of adequate criteria and measurement techniques for many personality variables. Another fruitful area is seen in the problem of the effects of prolonged anxiety and possible adjustment to this with resulting resistance to interference on cognitive tasks.

116 pages. \$1.45. Mic 56-251

**THE FORMATION OF LEARNING SETS WITH  
MENTALLY RETARDED CHILDREN**

(Publication No. 15,090)

Melvin E. Kaufman, Ph.D.  
University of Pittsburgh, 1955

Eight mentally retarded children were trained on a series of 96 object-quality discrimination problems. Four of these Ss were subsequently given training on 48 discrimination-reversal and 96 Weigl-Principle discrimination-learning problems. To the extent possible, the retarded Ss met many of the criteria established by the American Association on Mental Deficiency for classification into the category, Familial Mental Retardation. The results were compared with those obtained by another researcher who investigated the same experimental problem with a group of normal children.

The results indicated that retarded children gradually "learned how to learn" individual problems and apply this learning to subsequent problems. Retarded Ss were found to be capable of forming object-quality and discrimination-reversal learning sets. The Weigl-Principle discrimination problem was most difficult for this group.

Normal children were statistically superior to the retarded group in their ability to form Weigl-Principle discrimination-learning sets. The normals also tended to be superior in forming object-quality discrimination-learning sets. No statistical difference was found between the groups on ability to form discrimination-reversal sets. A degree of overlap between the groups was found on object-quality and discrimination-reversal learning.

As a result of the present study, two types of perseveration tendencies were proposed: type "A" and type "B". Type "A" was found to be characteristic of the retarded group on object-quality discrimination learning. In contrast, there was no significant difference between normal and retarded Ss on type "B" perseveration errors made on the discrimination-reversal learning task.

102 pages. \$1.28. Mic 56-252

**AN EXPERIMENTAL INVESTIGATION OF THE  
PERSONALITY STRUCTURE OF CHRONIC  
ALCOHOLIC, ALCOHOLICS ANONYMOUS,  
NEUROTIC AND NORMAL GROUPS**

(Publication No. 13,748)

Rudolf E. S. Mathias, Ph.D.  
The University of Buffalo, 1955

On the basis of psychoanalytic theory, specific hypotheses can be postulated in respect to the personality



structure of alcoholics. These specific hypotheses are related to the following variables. (I) Oral fixation, (II) homosexual trends, (III) needs for self aggression, (IV) marked needs for self assertion and defiance, (V) marked needs for submission and self debasement, and (VI) paranoid trends.

A total number of 100 subjects were studied. There were four matched groups. (A) subjects from Alcoholics Anonymous, (B) chronic alcoholics, (C) neurotics and (D) normals.

Tests utilized in the study were the Rorschach Test, the MMPI, and two new projective tests. The first projective test, the Madison Picture Test, consisted of five pictures to which the subject gave stories. These pictures had been specifically designed to elicit responses indicating oral trends, anal trends, and relationship toward authority. The second projective test consisted of Free Verbalization records of each subject for a time period of twelve minutes.

The Madison Picture Test and the Free Verbalization records were evaluated by raters. A scale was designed on which each rater indicated six judgments in regard to the coded protocol under scrutiny. Ratings were (1) evidence of paranoid indications, (2) evidence of self aggression, (3) evidence of orality, (4) evidence of homosexuality, (5a) evidence of extreme submission to authority, and (5b) evidence of extreme resistance to authority. Two psychologists rated the protocols of the Madison Picture Test. Two psychiatrists rated the Free Verbalization records.

A total of 35 measures were derived from the four tests. The use of multiple test criteria made it feasible to examine the six general assumptions in respect to the personality structure of alcoholics on a variety of psychological measures.

Evaluation of the findings indicated that the hypotheses which postulated differences amongst the four groups in amount of oral fixation were not supported by the data. The data relevant to the hypothesis on homosexuality revealed only suggestive trends. The assumption that chronic alcoholics have strong paranoid trends was refuted by the data. The hypothesis that chronic alcoholics have strong self aggressive trends was in part supported by the findings. The hypothesis that chronic alcoholics have marked needs for self assertion and defiance was also supported by the data to some degree. The hypothesis that chronic alcoholics have marked needs for submission and self debasement was also supported by the findings.

Results on the MMPI indicated the tests' high discriminatory power; results on the Rorschach Test failed to reveal significant differences amongst the groups. Results of the Madison Picture Test and Free Verbalization Test while not highly significant indicated the usefulness of both tests particularly as an additional measure on some of the dimensions of personality.

Significant results present a consistent pattern, particularly since they are based on multiple criteria of measurement. The main difference between the chronic alcoholics and Alcoholics Anonymous subjects seems to lie in their method of handling aggression. The chronic alcoholic group gives a picture of strong self aggressive trends, low verbal productivity, and high dysphoric elements. The Alcoholics Anonymous group presents a converse pattern of low self aggressive trends, high verbal productivity, marked hypomanic trends and paranoid symptom formation. Apparently the principal change which the chronic alcoholic experiences as a member of Alcoholics Anonymous occurs in the altered

direction of his aggressive impulses. The aggression of the chronic alcoholic is directed inward and the aggression of the subject from Alcoholics Anonymous is directed outward and takes other forms. These forms are hypomanic and paranoid trends. The chronic alcoholic attempts to counteract his aggression by drinking, or punishes himself by self destructive behavior.

128 pages. \$1.60. Mic 56-253

#### MEDIATED GENERALIZATION AND THE INCUBATION EFFECT AS A FUNCTION OF MANIFEST ANXIETY

(Publication No. 15,147)

Martha Tamara Mednick, Ph.D.  
Northwestern University, 1955

Supervisor: Janet A. Taylor

The present study was designed as an attempt to reproduce in conditioning of the psychogalvanic response (PGR) previously reported phenomena of verbally mediated generalization and the incubation effect (i.e. greater responsiveness during extinction with greater lapses of time between conditioning and extinction). In addition an investigation was made of the relationship of these phenomena to the level of manifest anxiety as measured by the Heine-man revision of the Taylor Anxiety Scale (TAS).

Two groups of 45 Ss each were chosen on the basis of extreme scores on the TAS. A conditioned PGR was first established in all Ss by repeated pairings of a critical word (CS) with a raucous buzzer. Tests of mediated generalization stimuli words to which the critical word was associated as determined by free associations of a standardization group. In order to investigate the incubation effect the two anxiety groups were further subdivided following training into three subgroups differing in the length of the rest interval between conclusion of training and the institution of extinction trials (immediate extinction, 10 min. interval, and 24 hr. interval).

Analysis of the results demonstrated heightened responsiveness towards words associated with the word to which the PGR had been conditioned, thus indicating that verbally mediated generalization had taken place. Increased PGR reactivity was found following the 24 hr. pre-extinction interval (i.e. an incubation effect) but the influence of this effect was short-lived being confined to the early part of extinction. The 10 min. delay prior to extinction did not result in galvanic activity which was significantly greater than that found with the immediate extinction condition.

It was also found that extreme scores on the TAS were directly related to the magnitude of mediated generalization responsiveness. In agreement with reports of other investigators level of manifest anxiety was found to be directly related to conditioning responsiveness as well as to resistance to extinction.

72 pages. \$1.00. Mic 56-254



### PERMEABILITY: A DIMENSION OF CONCEPTUAL BEHAVIOR

(Publication No. 14,417)

Spiro Bud Mitsos, Ph.D.  
Purdue University, 1955

Major Professor: A. W. Landfield

Thirty hospitalized psychotics, twenty-nine hospitalized alcoholics and twenty-nine normal individuals were tested with a variety of new and adapted measuring devices in order to test predictions derived from three theoretical hypotheses based on Kelly's psychology of personal constructs.

The hypotheses were as follows:

1. It is possible to predict from the permeability of a single concept in a person's conceptual system to certain aspects of the individual's total approach to situations, thus indicating a generality of permeability within conceptual systems.

2. Normal individuals are characterized by a moderate degree of permeability whereas pathological individuals conceptually tend toward the extremes of impermeability and excessive permeability.

3. Excessively permeable individuals will tend to be more systematized while the impermeable individuals will tend to be more confused and fragmented.

Permeability was defined, after Kelly, in terms of the extent to which a concept can be used to encompass new events. This is thought of as a continuum with polar extremes of impermeability and excessive permeability.

In the main, the data were conflicting. Only the second hypothesis could be accepted. The others could neither be fully accepted nor rejected.

The investigator makes some theoretical "guesses" that might account for the results and criticizes certain aspects of his experimental approach to the problem. Several suggestions are made regarding further research in this area.

70 pages. \$1.00. Mic 56-255

### PERCEPTUAL BEHAVIOR OF HALLUCINATORY AND DELUSIONAL PSYCHOTICS

(Publication No. 14,418)

John G. Napoli, Ph.D.  
Purdue University, 1955

Major Professor: John M. Hadley

A study was made in which the perceptual abilities of thirty delusional, thirty hallucinatory and twenty-one non-delusional, non-hallucinatory hospitalized psychotic white males were compared. The experimental groups were categorized on the basis of ward behavior which was quantified by means of an eight item modification of the Lorr Scale. The experimental tasks were constructed so as to provide measures of perceptual span, perceptual accuracy, both auditory and visual, and perception time. The general hypothesis underlying this study stated that delusional individuals are more oriented to external stimuli than are hallucinators. Specific predictions were made to the effect

that the delusional individuals would exceed the hallucinatory individuals in all perceptual skills as tested. It was further predicted that the non-delusional, non-hallucinatory group would be superior to the hallucinators in their test performance. A prediction of lack of difference between the non-hallucinating groups was made.

The results of this experimentation indicated that the predicted difference existed between the delusional group and the hallucinatory group with respect to total score and this difference was significant at the 1.0 per cent level of confidence. The non-delusional, non-hallucinatory group vs. the hallucinatory group comparison, with respect to total score, fulfilled the prediction but at the 5 per cent level of confidence. No significant differences were found to exist between the delusional and non-delusional, non-hallucinatory groups.

The auditory discrimination task provided the maximum discrimination among the groups tested. The general hypothesis was supported by the data. It is speculated that perceptual decrements in the hallucinatory group are attributable, in part, to the division of attention between hallucinated and real stimuli. No experimental data was gathered that would facilitate a test of this premise. A speculative section is presented relating this study to other aspects of these phenomena.

59 pages. \$1.00. Mic 56-256

### AN INVESTIGATION OF THE RELATION OF ANXIETY AND TASK CONDITIONS TO SERIAL ROTE LEARNING

(Publication No. 15,096)

Esther Gould Noll, Ph.D.  
University of Pittsburgh, 1955

This research was concerned with the relation of anxiety and task conditions to the learning of verbal material. A 2 x 2 x 2 factorial design, with two levels of anxiety, two levels of list difficulty, and two rates of presentation, was employed to investigate these relationships. List difficulty was manipulated in terms of intra-list similarity and association value; the difficult list possessed high intra-list similarity and low association value, and the easy list possessed low intra-list similarity and high association value. Two- and four-second rates of presentation were employed.

Sixty-four experimental subjects were selected on the basis of their scores on the Taylor Anxiety Scale, and were randomly assigned to the four experimental conditions. There were eight anxious subjects and eight nonanxious subjects in each of the four groups.

Four experimental hypotheses were formulated on the basis of the extension of Hull's theoretical formulations made by Spence, Taylor, and Montague.

An analysis of variance and t test was performed on the data.

It was predicted that all subjects would learn less efficiently under Condition 1, which consisted of the difficult list with the two-second rate of presentation, than under any of the other conditions; and that anxious subjects would learn less efficiently than nonanxious subjects. The results indicated that there were statistically significant



differences between the performance of all subjects under this condition as compared to their performance under the other conditions. However, there were no differences between anxiety groups.

It was predicted that anxious subjects would learn less efficiently than nonanxious subjects under Condition 2, which consisted of the difficult list with the four-second rate of presentation. The results failed to confirm this prediction.

It was predicted that anxious subjects would learn less efficiently than nonanxious subjects under Condition 3, which consisted of the easy list with the two-second rate of presentation. The results showed no statistically significant differences between these groups. All subjects learned more rapidly under this condition than under either of the previous conditions.

It was predicted that all subjects would learn more efficiently under Condition 4, which consisted of the easy list with the slow rate of presentation, than under any of the other conditions; and that anxious subjects would learn more efficiently than nonanxious subjects. The results indicated that the slow rate of presentation facilitated the learning of all subjects, but that this facilitation was no greater for anxious subjects than for nonanxious subjects. There was a trend toward better performance by the nonanxious group on the first block of 20 trials, but this difference disappeared over the second block of 20 trials, suggesting that anxious subjects tend to require a greater number of trials to become habituated to a task.

The results indicated that overall task difficulty is a function of both rate of presentation and list difficulty, although the latter variable appeared to be a more important determiner.

The results of this research, with regard to the relationship of anxiety to verbal learning, suggest that some of the conflicting results which have been obtained in this area may be the result of differences in experimental arrangements. However, since many of the investigators have made their predictions on the assumption that the effects of anxiety on learning are a function of task conditions, the failure of such interactions to appear consistently suggests that the discrepancies in findings cannot be attributed entirely to varying experimental conditions. This would tend to cast some doubt on the generality of the theoretical formulations which have been advanced to explain the relationship between anxiety and performance in complex learning situations, and which have assumed that the response competition aroused in such situations is differentially affected by varying levels of anxiety. 54 pages. \$1.00. Mic 56-257

#### A COMPARATIVE ANALYSIS OF DEVIANT RORSCHACH RESPONSE CHARACTERISTICS

(Publication No. 15,102)

William Thomas Powers, Ph.D.  
University of Pittsburgh, 1955

This study attempts to isolate and test the discriminative effectiveness of the variables, implicit or explicit, in David Rapaport's discussion of deviant Rorschach responses, which Rapaport feels are indicative of the possible or probable presence of schizophrenia.

Four relatively discrete and homogeneous classes of

deviant Rorschach responses were isolated on the basis of an a priori analysis of Rapaport's descriptions of responses. These four classes were: (a) responses showing intellectual disorganization; (b) socially unacceptable or offensive responses; (c) responses showing inappropriate over-control or under-control; and (d) responses characterized by openly expressed affect. Definitions and scoring procedures were developed for each class of response. The main statistical analyses were based on the four classes.

One hundred and five subjects were tested in the study, 35 normals, 35 neurotics, and 35 schizophrenics. On the basis of the variables of sex, I.Q., age, and education, the 35 subjects in each group were divided into two comparable groups of 25 subjects and 10 subjects. The group of 75 subjects (25 from each of the three groups) was called the original sample, while the groups of 30 subjects (10 from each of the three groups) was called the replication sample.

The following hypotheses were tested:

Hypothesis I: The 25 schizophrenic subjects in the original sample will have a significantly higher mean score for each of the four classes than the 25 normal subjects in the original sample.

Hypothesis II: The 25 schizophrenic subjects in the original sample will have a significantly higher mean score for each of the four classes than the 25 neurotic subjects in the original sample.

Hypothesis III: The four classes will correlate significantly using multiple correlation procedures, in the comparison of the 25 normal subjects and 25 schizophrenic subjects in the original sample.

Hypothesis IV: The four classes will correlate significantly, using multiple correlation procedures, in the comparison of the 25 neurotic subjects and 25 schizophrenic subjects in the original sample.

Hypothesis V: The beta weights obtained for the normal-schizophrenic multiple correlation comparison in the original sample will significantly differentiate the 10 normal subjects in the replication sample from the 10 schizophrenic subjects in the replication sample.

Hypothesis VI: The beta weights obtained for the neurotic-schizophrenic multiple correlation comparison in the original sample will significantly differentiate the 10 neurotic subjects in the replication sample from the 10 schizophrenic subjects in the replication sample.

Hypothesis I and Hypothesis II were upheld in part. The schizophrenic subjects had significantly higher mean scores than the normal subjects for the two classes reflecting intellectual disorganization (class A) and inappropriate over-control or under-control (class C). The schizophrenic subjects had a significantly higher mean score than the neurotic subjects for the class reflecting intellectual disorganization (class A). For class D, the results were the opposite of that predicted, with both the normal subjects and the neurotic subjects having higher mean scores for this class than the schizophrenic subjects. Only the neurotic subjects, however, had a significantly higher mean score for class D than the schizophrenic subjects. The schizophrenic group, therefore, showed significantly more intellectual disorganization than either the normal or neurotic group, significantly more inappropriate over-control or under-control than the normal group, and significantly less affective response than the neurotic group.

Hypothesis III and Hypothesis IV were both upheld. The multiple correlation coefficients, respectively, of .72 and .75 were both significant at the .01 level.



Hypothesis V and Hypothesis VI were also both upheld. Point-biserial coefficients were obtained, respectively, of .82 and .83 and both coefficients were significant at the .01 level.

The reliability of the four classes was determined and all were significantly reliable.

The general conclusion is that the four classes are reliable and valid and that further studies using these classes should be done. 77 pages. \$1.00. Mic 56-258

#### THE EFFECTS OF EGO-DEFENSIVE REACTIONS ON REPORTED PERCEPTUAL RECOGNITION

(Publication No. 15,383)

Donald Taylor Shannon, Ph.D.  
Stanford University, 1955

This investigation was primarily concerned with the perceptual recognition behavior of individuals using three different types of ego-defensive reactions. A second part involved the study of the relationship between ego-strength and types of defensive reactions. The main group of hypotheses and related experimental predictions were derived from a conceptual framework based on the assumption that perceptual recognition behavior reflects, in part, the underlying personality dimension of ego-defenses. The two main concepts involved in the predictions are those of "perceptual sensitization" and "perceptual defense." It was hypothesized that the ego-defensive reactions of "Externalization" and "Acting-out" would be associated with perceptual sensitization for threatening stimuli, whereas the ego-defensive reaction of "Internalization" would be associated with perceptual defense against threatening stimuli. The prediction made and tested concerning the relationship between ego-strength and defensive reactions was that Externalizers would score higher on a measure of ego-strength than would Internalizers. Certain corollary hypotheses, developed from the general rational of the utilitarian function of ego-defensive reactions, were also tested.

Fifty-one adult male hospitalized psychiatric patients were selected and classified into one of the three defensive reactions studied, on the basis of the consensus of several clinical judges. Two types of visual stimuli were used for the perceptual measures. The first type was composed of words relating to the conflict areas of sex, aggression, and dependency, and neutral words matched in frequency of usage, length, and general configuration to the conflict words. The second set of visual stimuli consisted of line drawings depicting sexual and aggressive behavior, and neutral drawings depicting sexual and aggressive behavior, and neutral drawings matched for physical stimuli characteristics. Perceptual recognition was tested by a modified tachistoscopic presentation of slides. Ego-strength was measured by the "C" score of McReynolds' Concept Evaluation Technique.

The following conclusions may be drawn from the results of the study.

1. Different ego-defensive reactions significantly effect the reported recognition thresholds of conflict-relevant stimuli.
2. Individuals who defend against threat by Externalization report significantly lower recognition thresholds for conflict than for neutral stimuli.

3. Individuals who defend against threat by Internalization report significantly higher recognition thresholds for conflict than for neutral stimuli.
4. Individuals who defend against threat by acting-out in verbal and nonverbal behavior report significantly lower recognition thresholds for conflict than neutral stimuli.
5. Primary conflict-relevant versus other conflict-relevant stimuli does not appear to effect differential recognition thresholds in a hospitalized population.
6. Familiarity with stimuli significantly lowers the recognition threshold for both conflict and neutral stimuli, but does not alter the difference in recognition thresholds for conflict and neutral stimuli for the three groups.
7. Ego-strength as measured by the CET is not significantly related to the three different types of ego-defensive reactions of externalization, internalization, and acting-out.

122 pages. \$1.53. Mic 56-259

#### PERSONALITY CONFIGURATIONS OF ADULT MALE PENAL POPULATIONS AS REVEALED BY THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

(Publication No. 13,794)

Robert Edward Smith, Ph.D.  
University of Minnesota, 1955

The purposes of this investigation were to investigate the personality characteristics of white, adult, male prison inmates as revealed by the MMPI; to compare the MMPI records of inmates from several penal institutions; to compare the personality characteristics of penal inmates with "normals" and with "abnormals;" and to discuss the implications of the findings for psychologists and penologists.

Six penal samples from the Maryland State Penitentiary, the Minnesota State Prison and the Minnesota State Reformatory, and from Pennsylvania, Texas and Washington State were used in the investigation. The first three of these samples were studied intensively; their respective N's after removal of invalid profiles were 434, 180, and 184 inmates.

Three methods of analysis were employed: an atomistic approach dealing with measures of central tendency and variation on each MMPI scale taken discretely, a more configural approach by means of high-point and low-point codes, and a complicated holistic approach, the Hathaway-Meehl method of profile analysis, designed to construct a profile expressive of the salient features of the sample.

The first of the above analyses shows a remarkable similarity between the mean T score profiles for the various penal samples. The MSP sample is statistically different from four other samples in only 15 out of 49 scale comparisons (P .05) and the practical significance of many of these differences is doubtful. When compared with a "normal" and an "abnormal" sample drawn from the Minnesota area, the MSR and the MSP samples are different in 44 of 52 scale comparisons. The coded mean T score profiles emphasize scales 4 and 2 as the highest scales



and scales 0, 5 and 1 as the lowest scales with F highest among the validity scales.

Analysis by coded profiles shows a close similarity between the MSR, MSP, and MdSP samples. When these three samples are combined, scale 4 dominates the high point codes with scales 2 and 9 as common secondary points. Scales 5 and 0 are the most frequent low points. However, although codes indicative of psychopathic types of behavior problems predominate, it is clear that definite minorities of neurotic, psychotic and "normal" codes are also present. In general, however, the coded profiles of the penal inmates are unlike those found in a "normal" and an "abnormal" sample.

The Hathaway-Meehl profile analysis resulted in two criterion profiles which may be said to represent the salient features that contribute to the patterning of the samples. The coded criterion profiles are 4\*678'1239'50- F' for the MSR sample and 4\*6'2389'170-5/ F- for the MSP sample.

In summary, a marked degree of homogeneity of behavior on the MMPI by inmates from a number of penal institutions was demonstrated. It was also shown that incarcerated criminals are different from "normals" and "abnormals." In terms of personality characteristics, the penal inmates appear to be predominantly psychopathic individuals — masculine, aggressive, outgoing but situationally depressed. Definite minorities of neurotic, psychotic and normal individuals also appear to be present in the penal population.

The nature of the class of behavior problems, the psychopathic deviates, that typify the incarcerated criminal is discussed at some length. The salient characteristics of these individuals are their antisocial behavior, their failure to learn by experience, shallowness of affect and inability to form warm and therapeutically useful personal attachments. Emphasis in the discussion was placed on the relative incorrigibility of these individuals, upon the inadequacies of standard therapies for their rehabilitation and upon the relative therapeutic responsiveness of the minorities of neurotic, psychotic and normal individuals.

Suggestions for further research were centered about the need for longitudinal studies and the identification of subgroups of criminals and of disciplinary problem cases. The meanings of the various MMPI codes should be established and the relative values of the various methods of analysis should be investigated.

219 pages. \$2.74. Mic 56-260

## PSYCHOLOGY, EXPERIMENTAL

### PROBLEM SOLVING IN MULTIPLE-GOAL SITUATIONS

(Publication No. 15,294)

Scarvia Bateman Anderson, Ph.D.  
University of Maryland, 1955

Supervisor: Professor Charles N. Cofer

**Problem.** Analysis of situations designated 'problem-solving situations' indicates that experimenters may focus attention upon manipulation of characteristics of (a) given information or material, (b) goal, (c) means of proceeding

from given to goal, (d) persons to whom the situation is a problem, and/or (e) environment in which the problem is faced. The present experiment centers about the goal — the aspect of problem-solving situations most neglected in previous research. Specifically, the experiment was designed to study the relationship between number of different plausible goals stated for the subject and progress, efficiency, redundancy, accuracy, activity level, timing of responses, and "tactics" in problem solving. Number of goals was varied from one through four.

**Subjects.** The subjects were 48 navy enlisted men, homogeneous with respect to General Classification Test Scores.

**Procedure.** Calculus of propositions problems (advantageous because they permit manipulation of goals and discrimination of subjects' problem-solving steps) were used. The four experimental problems consisted of three premises and from one through four stated goals. Although in the case of multiple goals any goal appeared plausible to subjects, only one was actually deducible (by a set of six sequentially dependent steps). Following training in the rules of the calculus task and work on 10 practice problems, each subject participated in four experimental sessions lasting a maximum of 30 min. each. A randomized block design was used with two replications; each subject received every problem and every goal condition, but the combinations and orders were different for each subject within the same group of 16.

**Results.** The results, interpreted in terms of interference between responses oriented toward competing goals, are as follows:

1. Number of subjects obtaining solution and/or the last two relevant steps leading to solution is an inverse function of number of goals.
2. Probabilities of successive relevant steps and solution following each relevant step vary as a function of number of goals.
3. The probability of an irrelevant step following a relevant step is greater under all goal conditions than the probability of a relevant step following a corresponding irrelevant step.
4. There is a tendency for efficiency (in terms of a comparison of number of relevant steps with total correct steps) to decrease as number of goals increases; however, the results are inconclusive.
5. Number of subjects engaging in redundant activity is a direct function of number of goals.
6. Number of subjects making errors (violations of rules for working on problems) is not related to number of goals.
7. Activity level (number of steps attempted per minute) is not related to number of goals.
8. Timing of responses (in terms of distribution of effort over time, time of solution, variation in time between responses, and latency prior to first response) is not significantly related to number of goals.
9. Number of subjects introducing unnecessary material to problems is a direct function of number of goals.
10. Number of different rules used, number of shifts in content used, and number of subjects using certain specific rules for working on the calculus task are not related to number of goals.

117 pages. \$1.46. Mic 56-261



THE EFFECT OF CONVENTIONAL  
ELECTROCONVULSIVE SHOCK (ECS) VS.  
"BRIEF STIMULUS THERAPY" (BST) ON  
MEMORY, NEST BUILDING, AND ACTIVITY  
IN ALBINO RATS

(Publication No. 15,363)

Richard Floyd Docter, Ph.D.  
Stanford University, 1955

Albino rats were subjected to two forms of electroconvulsive stimulation (BST and ECS), and their adjustment during and after these seizures measured with respect to retention and relearning, nest building, and spontaneous activity. The basic experimental question was: Are the behavioral consequences of a series of convulsions dependent upon the characteristics of the convulsive stimulus?

In the retention-relearning study, 52 subjects were divided into three matched groups: BST, ECS, and pseudo-shock controls. After learning a complex 13-unit maze they were subjected to electroshock and then returned to the maze to obtain records of relative proficiency. Significant differences in error scores among the three groups are seen during the Shock Period (relearning with concurrent shock); BST animals commit significantly fewer errors than ECS subjects. Rapid recovery of maze accuracy follows cessation of shock, yet the groups still differ significantly during the first ten postshock days. The BST group requires fewer days to regain mastery of the maze than does the ECS group. Given ten days of practice after shock ends, the three groups perform equally well. Testing for possible effects which might be seen fifty days following shock, the three groups were returned to the maze, but no significant differences were obtained. Throughout this study, speed of maze running was approximately the same for the three groups. The two shock groups showed very similar weight changes with the onset and cessation of shock.

A second study compared the relative disruption of innate patterns of nest building in rats given ECS, BST, and in pseudoshock controls. There is a very marked difference among the three groups when nest building is evaluated during concurrent shock. The BST group shows significantly less disruption of nest building than does the ECS group. When shock ends, both seizure groups show rapid improvement and obtain ratings equivalent with the controls after approximately 72 hours.

In a third study we found that spontaneous activity in revolving wheels decreases during periods of convulsive stimulation in both BST and ECS subjects. The BST group shows slightly greater activity during these periods, but the difference is not significant. However, when shock terminates, a more rapid recovery is seen among the BST animals, and this difference is statistically significant at the .10 level.

A complete explanation of the results is impossible at present, but the data are clearly more consistent with the hypothesis of temporary change in brain functioning than with the idea of brain damage.

Our results give increased weight to the claim that special forms of convulsive stimulation, such as BST, can produce grand mal convulsions without the degree of "harmful side-effects" associated with ECS.

111 pages. \$1.39. Mic 56-262

BINOCULAR CONFLICT AND RESOLUTION

(Publication No. 13,689)

Edward Engel, Ph.D.  
Princeton University, 1955

The principal concern in the present investigation is with the type of binocular resolutions which occur when the two eyes are separately stimulated with forms differing in "meaningful" content. The problem raised is whether such content is influential in determining the resolutions achieved.

In a preliminary attempt to explore the problem, a stereogram was made up of two figures each being a portion of a photographed statue representing a male nude. One eye was stimulated by the head portion of the statue while the other eye was stimulated by the hip portion including the genital area. 27 Princeton undergraduates were given this stereogram to observe for a period of one minute.

Of the 27 observers, 14 recognized and identified the genitals appearing in the field at some time during the 60 second viewing period. In two other cases, objects of a sexual nature appeared. In the remaining 11 cases, no genital or sexual object was ever reported. In those cases where the genitals were not identified, monocular inspection of the two figures individually was followed by subsequent binocular recognition of the genitals in the visual field.

In the second phase of the investigation, a number of stereograms were made up consisting of the photographed faces of two different persons, one face being the left eye view, the other being the right eye view. Stereoscopic observations of these stereograms yielded a single continuous impression of a "three dimensional" face which was comparable to the binocular impression of two views of the same face. The composition of the "binocular" face tended to differ markedly for the various observers. Also, the "binocular" face was almost invariably preferred over the two monocular components when a comparison was made.

In the final phase of the investigation, an attempt was made to critically test the hypothesis that object content is an effective variable where dissimilar monocular forms are combined binocularly. To test this hypothesis, a stereoscopic arrangement was employed wherein one eye was stimulated with a face in normal orientation while the other eye was presented with a face upside down. 12 subjects were given 4 conditions to observe in which each face was presented to each eye of a given subject in both the upright and inverted positions.

Of the 48 responses given by the group as a whole (12 S's each giving 4), 41 were "upright predominant," 4 were "equally predominant" and 3 were "inverted predominant." In the case of every subject, the number of "upright predominant" responses exceeded the number of "inverted predominant" responses for the four conditions presented. The results obtained thus confirmed the prediction that the face in upright position has a definite and reliable advantage with regard to predominance in the binocular field.

The findings in the investigation are interpreted as supporting the contention that object content is an effective variable in binocular conflict situations. The role of object meaning is discussed with respect to binocular rivalry, fusion and suppression. 80 pages. \$1.00. Mic 56-263



# EFFECT OF ACTIVITY LEVEL ON SIMPLE AND COMPLEX TASK PERFORMANCE IN DEFECTIVES

(Publication No. 15,466)

James Garrison Foshee, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: Nicholas Hobbs

The purpose of the present study was to determine whether varying levels of drive have differential effects upon simple and complex learning. The study was developed as a test of the Hullian formulation concerning the relationship between drive and performance. An additional purpose involved the presentation of a method by means of which an objective measure of drive, as defined in this study, may be obtained.

Activity level measures, obtained by means of a modified ballistocardiograph apparatus, were gathered on 101 Ss from the Tennessee State residential institution for mentally retarded persons. Level of activity was assumed to reflect the amount of underlying drive. Forty-eight Ss, 24 from the high end and 24 from the low end of the resulting distribution of activity scores, were then run in two learning situations. Performance scores were obtained for the 48 Ss in a simple and a complex card sorting task in order to test the hypothesis that there would be a significant learning task by drive level interaction. The results did not confirm the hypothesis.

The possibility that these results contradict Hull's position was considered, together with alternative explanations for the obtained data which would be consistent with Hullian theory. It was concluded that, to the extent that such alternative hypotheses could be regarded as tenable, the study did not constitute a crucial test of the Hullian formulation.

Finally, suggestions were presented regarding further possible uses which might be made of the apparatus utilized to obtain activity level measures.

57 pages. \$1.00. Mic 56-264

# REMINISCENCE AND FORGETTING OF THE ROTARY PURSUIT HABIT AFTER EXTENDED REST INTERVALS

(Publication No. 15,138)

John Curtis Jahnke, Ph.D.  
Northwestern University, 1955

Supervisor: Carl P. Duncan

It was suggested that the postrest performance differences in motor learning between groups given prerest massed practice (MP) and groups given prerest distributed practice (DP), which have often been attributed to conditioned inhibition ( $sI_r$ ), could just as reasonably be interpreted as due to undissipated reactive inhibition ( $I_r$ ), or to different habit strengths developed by the groups during prerest practice, or both. To gather information on this alternative explanation, 20 groups of university men (each group consisting of 20 Ss) were practiced on a pursuit rotor. Two sets of six groups each received 6 min. of prerest practice followed by rests of either 10 min., 1 day, or 1, 2, 3, or 4 weeks. One set of six groups received prerest

practice in cycles of 10 sec. work-20 sec. rest; the other set received continuous prerest practice. Four of the remaining eight groups received 100 sec., and four received 150 sec., of prerest practice in cycles of 5 sec. work-25 sec. rest, and were then given rests of 1, 2, 3, or 4 weeks. Postrest practice was 3-1/2 min. with the 10-20 cycle for all groups.

The essential findings were:

1. Both initial and final postrest performance differences between corresponding length-of-rest MP and 10-20 DP groups became less with increased rest up to one week, although coincidence of the MP and 10-20 DP curves was never obtained. These findings were taken as evidence for the continued dissipation of  $I_r$  over periods of time greater than have been assumed previously.

2. The differences between corresponding length-of-rest MP and 10-20 groups, although becoming less with increased rest, were significant on both the initial and final postrest trials. Although MP Ss performed better than any of the 5-25 groups on final postrest trials, they never performed as well as 10-20 Ss. This difference was assumed to be due to less habit strength developed by MP Ss during prerest practice.

It was pointed out that the data did not disprove  $sI_r$ , but that previous measurements of  $sI_r$  may have been confounded by residual  $I_r$  and by other factors which may influence initial postrest performance.

60 pages. \$1.00. Mic 56-265

# THE EFFECT OF AN AVERSIVE CONDITIONED STIMULUS ON THE EXTINCTION OF AN AVOIDANCE RESPONSE IN MONKEY

(Publication No. 15,091)

Henry E. Klugh III, Ph.D.  
University of Pittsburgh, 1955

Evidence in the literature and the results of a pilot study showed that the termination of the conditioned stimulus used in some avoidance conditioning studies may have been intrinsically reinforcing for the animal. The problem was to determine if a typically used CS could be aversive and secondly if differential reactions by the animals to the CS termination would aid in predicting trials to condition and trials to extinction in an avoidance paradigm.

Eight rhesus monkeys served as subjects in the study. Their rate of crossing the center line of a shuttle box was recorded for ten consecutive daily periods lasting 30 minutes. On the eleventh day a 1000 cps 55-decibel tone was introduced, and terminated when the animal crossed the center line of the box. Fifteen seconds after the response the tone was reintroduced. This sequence continued for 30 minutes a day for all animals during eight more consecutive days. The animals were then subjected to avoidance conditioning in a modified Skinner box. A tone of nearly the same characteristics as that used in the shuttle box phase served as the CS. Eight seconds after its initiation it was followed by shock unless the animal pressed a bar. This bar-press response terminated the tone or, for latencies longer than eight seconds, tone and shock. During extinction no shock was given. If a CR was not made within eight seconds, E terminated the tone at the end of the CS-US interval.



Reliabilities of the operant and escape measures were found to be satisfactorily high. A repeated-measures analysis of operant and escape conditions revealed significant differences in number of shuttle box crosses between animals and between conditions. With the daily 30-minute test divided into ten-minute periods no significant differences between periods were noted.

The "t" test of consecutive daily mean differences over the 18 days revealed only one significantly different from chance at the .01 level of confidence. That was the difference between last operant day and first tone (escape) day.

Interaction of subjects and conditions, and of subjects and periods, were also significant. A high degree of individual stability of subjects' scores between periods over the conditions was noted.

A measure of the sensitivity of tone for each animal was derived using each subject's deviation from his predicted number of escape crossings. This prediction of escape crossings was based on the correlation of the operant measure with the escape measure. Seven other variables were derived which, on the basis of previous research, might have predicted either trials to condition or trials to extinction. None of the observed correlations between these predictor variables and the criterion variables were significantly different from chance at the .05 level of confidence.

An interpretation of the increase in crossing responses as being due to the effect of tone is made with reservation since no control group was provided for this phase of the study. The lack of relationship between the measurement of the animals' reaction to tone and the criteria may have been because of large individual differences in the animals' reaction to shock. This would tend to obscure the effect of the reaction to tone in predicting the criteria.

56 pages. \$1.00. Mic 56-266

#### A METHOD OF GENERATING AND SCALING RANDOM VISUAL FORMS OF GRADED SIMILARITY

(Publication No. 15,376)

David Lee LaBerge, Ph.D.  
Stanford University, 1955

This investigation was concerned with three problems, the description of a method of generating random visual forms of graded similarity, the scaling of two sets of forms generated by this method, and the derivation and testing of a general technique by which subjects' responses might be predicted.

A random visual form was produced by drawing lines between ten random points on a two dimensional surface. The form was then transformed by moving the points in random directions, resulting in a series of gradually distorted forms along one dimension. By rotating the direction of the transformation 90 degrees, a second dimension was produced. In this manner two independent matrices of objectively equally spaced stimuli were generated, a 6 x 6 matrix and a 6 x 21 matrix.

A measure of the objective distance between adjacent forms was obtained by analyzing the total transformation of points from one figure to the next into translation, rotation, expansion, and distortion components. The distortion component was computed as a remainder term when the

other three components were taken out by least squares analysis. The objective distances measured in this manner were found to be approximately equal.

To determine how closely the subjective spacing of the forms (in terms of similarity) corresponded to the objective spacing, 114 subjects were tested on the matrices — 60 on the first, and 54 on the second. The method of scaling consisted in giving S a row or column of a matrix as identifiers, the second matrix having been subdivided into three 6 x 6 matrices. When E presented the stimuli one at a time, S indicated which of the identifiers the given stimulus most resembled. It was assumed that the percentage of choices of an identifier for any given stimulus is a measure of the subjective distance between the two.

Results showed that in general adjacent rows and columns of both matrices are equally spaced psychologically.

A technique based on the normal curve was devised to predict how subjects would respond to various sets of identifiers. It was quite successful in predicting to a set of six identifiers in a row, column, or diagonal of the first matrix, and with a few exceptions, was fairly successful in predicting to the second matrix.

A separate experiment produced evidence favorable to the assumption that predictions to a multiple identifier situation may be built up from predictions to pairs of those identifiers. The remainder of the study was devoted to testing the prediction technique on pairs of identifiers in a variety of positions with respect to the stimulus. The technique was valid when stimuli were fairly close to identifiers, but broke down when the stimuli were far removed from the pair of identifiers, and when the stimulus was between the two identifiers.

The following conclusions were made.

1. The proposed method can produce an enormous variety of unfamiliar forms.
2. The forms can be generated along dimensions such that their spacings are on the average approximately equal.
3. The prediction equation based on the normal density function is fairly successful in predicting the distributions of responses across six identifiers equally spaced along a dimension. However, it has serious flaws in making predictions to two identifiers.
4. It is probable that a pair of identifiers may be used as a basic unit into which more complex sets of identifiers may be analyzed.

134 pages. \$1.68. Mic 56-267

#### EFFECTS OF REMOVAL OF VISUAL CORTEX ON LEARNING AND RETENTION IN THE MONKEY

(Publication No. 13,717)

Jack Orbach, Ph.D.  
Princeton University, 1955

The present experiments were undertaken to study the effects of striate cortex lesions in the rhesus monkey, *Macaca mulatta*. The data reported by Lashley and Tsang for the rat indicated marked postoperative effects on maze running efficiency and latch box solution, effects which were interpreted as signifying intellectual impairment. The attempt was made to produce these symptoms in the monkey and, secondarily, to provide additional data regarding visual sensitivity following occipital lesions.



Four monkeys were trained on a series of somato-sensory discriminations of varying degrees of difficulty, on tests of generalization, transfer, and ability to respond differentially according to context and on a stylus maze, all without the aid of visual cues. Subsequent preoperative retraining indicated high retention on most tasks.

Partial striate cortex lesions involving the entire lateral occipital cortex and pole were produced in two monkeys. The other two were subjected to more complete striate cortex removals including all tissue caudad to the lunate and parieto-occipital sulci.

Postoperative retraining failed to demonstrate marked deterioration or learning disability on any non-visual task. In most cases, postoperative and preoperative retention scores were quite comparable. One monkey with a large lesion had difficulty in meeting the criterion on the various delays of the alternation problem, but performance by the others was unimpaired. Thus, the evidence does not warrant the assumption that striate cortex participates in non-visual learning and retention in the monkey. Discrepancies with the rat data are considered. Differences in the size and type of lesions, in the tests, as well as in the species employed may account for the discrepancies.

The visual status of the monkeys is described. Pronounced visual field defects were detected. Nevertheless, a remarkable capacity to solve color and pattern problems was preserved in the monkeys with more limited lesions.

Little or no savings in relearning the light-dark reaction was shown. Since none of the monkeys was completely insensitive to details, lack of retention can be attributed to the extensive scotomata to which the monkeys had to adjust. There were indications that adaptation to darkness may have been a necessary condition in relearning this task by monkeys with more complete striate cortex lesions.

The rat data suggest that these residual visual capacities were not instrumental in the failure to obtain deficit on the non-visual tasks.

89 pages. \$1.11. Mic 56-268

#### THE DEVELOPMENT OF LEARNING SETS IN NORMAL CHILDREN

(Publication No. 15,100)

William Martin Peterson, Ph.D.  
University of Pittsburgh, 1955

This study represented an attempt to explore the nature of development of object quality, discrimination reversal, and Weigl-principle discrimination-learning sets with a Normal group of 6 children ranging in age from 9 to 12. The three types of problems were of increasing complexity. It was necessary that each subject acquire a "principle" or learn a "set" before he could successfully master a given problem.

The Normal group of children, whose IQ's ranged from 90 to 109 inclusive, were carefully matched with a group of eight Retarded Ss whose IQ's ranged from 50 to 75. The data for the latter group of subjects were obtained from a research project, conducted by Melvin E. Kaufman, which explored many of the same theoretical and practical experimental problems that the present study investigated.

The selection of the Normal group was on the basis of the Stanford-Binet Test of Intelligence, Form L. Matching

controls included the age and sex of the children and the age at which the Ss began school. Subjects with gross auditory and visual defects and children with histories of emotional difficulties were eliminated.

The testing device for this experiment was the Wisconsin General Test Apparatus which was slightly modified to adapt its usage for human subjects.

Five hypotheses were formulated and experimentally evaluated. They included an analysis of the type of errors believed to be impeding the learning process.

1. It was predicted that the experimental groups of children would be able to develop object quality, discrimination reversal, and Weigl-principle discrimination-learning sets. The results indicated that both the normal and retarded children were able to acquire these sets in a rapid and continuous manner. Group variability for Normal Ss was relatively small. The more complex Weigl-principle problems proved the most difficult for the normal subjects.

2. The second hypothesis investigated involved a postulated relationship between IQ and facility in the formation of discrimination-learning sets. The results were inconclusive with regard to the Normal Ss because they constituted a narrowly defined and homogeneous group. When the question was related to the broad IQ groups studied in this project, however, the results indicated that Normal Ss generally were superior to the lower IQ group in the acquisition of learning sets.

3. It was predicted that statistically significant differences between normal and retarded groups with respect to facility in the formation of learning sets would be obtained. The results showed that in Trial 2 differences on the object quality problems were significant when the Fisher "t" test was the instrument utilized for the evaluation. Group differences on discrimination-reversal problems were evaluated and no significant differences were found. The retarded group, however, had opportunity for additional practice on the object quality problems and hence were not equated with the normal group on the experience factor. Significant group differences on the more complex Weigl-principle problems were obtained on Trial 2, problems 1-48 and on Trial 2 where the entire series of 96 problems was evaluated.

4. It was predicted that the retarded group would exhibit a statistically significant greater number of perseveration errors than the normal group. The results were significant at the .05 level of confidence in the predicted direction on the object quality and Weigl-principle problems.

5. It was predicted that the normal group would exhibit a significantly greater number of response shift errors than the retarded group. The differences between groups were not found to be significant. A trend was noted, however, in that as the problems increased in complexity, the group differences approached significance.

92 pages. \$1.15. Mic 56-269



THE EFFECTS OF AN "ANNOYING STATE  
OF AFFAIRS" ON THE JUDGMENTAL ERROR  
OF THE BRIGHTNESS OF A NEUTRAL  
VISUAL STIMULUS

(Publication No. 15,106)

Jerome Joseph Schiller, Ph.D.  
University of Pittsburgh, 1955

Two studies were performed to test the following hypotheses: First, a neutral visual stimulus paired with electric shock is judged with overestimated brightness. Second, repeated presentations of the visual stimulus, unaccompanied by shock, results in a decrement of the brightness level produced by the pairing procedure.

In the first study, 60 subjects, undergraduate volunteers, were assigned on a random basis to three different training groups.

The experiment consisted of six phases, the pretest phase, the shock level of determination phase, the training phase, the post-training test, the extinction phase, and the post-extinction test.

During the pretest, subjects had six judgment trials of the brightness of the modified Chinese symbol, projected onto a milk-white screen located in front of the subject. The first four judgments served as practice trials and the last two judgments as the pretest. Each judgment trial consisted of a two-second presentation of the visual stimulus at the standard intensity of 6.6 foot-candles, and a match of the standard from either a bright or dim variable setting presented 10 seconds after the standard. The sequence of intensity of the variable setting was the same for each subject for the three tests, but was counterbalanced within each group. During the 10-second delay between the presentation of the standard and the variable, the screen was illuminated at the intensity of the standard to maintain the subjects at a constant level of the light adaptation.

During the shock determination level phase, subjects in Groups I and II received three trials of shock in order to set a voltage level which felt "unpleasant" but not "painful".

The training phase for Group I consisted of five trials of the visual stimulus presented for two seconds at the standard intensity, accompanied by a shock of a one-second duration. Group II received five shocks of a one-second duration, and Group III received five two-second presentations of the visual stimulus.

The post-training test for all subjects was the same as used in the pretest.

The extinction phase for all subjects consisted of 10 trials of presentation of the visual stimulus at the standard intensity, unaccompanied by shock.

The post-extinction test consisted of two judgment trials carried out in the same manner as the pretest and the post-training test.

The results of the first study, although not supporting the hypotheses, suggested both brightness overestimation of the visual stimulus for the conditioned group on the first trial following training, and an interactive effect of training with the bright variable setting. The lack of significance was attributed to habituation of the subjects to electric shock.

The second study, which employed 32 undergraduate students, used a modification of procedure designed to reduce habituation to electric shock.

The results of the second study partially confirmed the major hypothesis. Although brightness overestimation was

not found as a function of training per se, a significant F value was found for the interaction of the intensity of the bright variable setting with training. The conditioned group significantly overestimated the brightness of the visual stimulus in comparison to both control groups, and manifested a significant increase in brightness overestimation compared to the "before" training brightness level.

Although the second hypothesis was not confirmed, the decrement of brightness overestimation of the conditioned groups was in the hypothesized direction.

An explanation of the results, based upon the G. S. R. studies with stimuli along an intensity continuum, was suggested in terms of increased "fear" as a function of intensity of the test stimulus.

A number of consequences of this explanation were examined, and suggestions for additional experiments were made.

86 pages. \$1.08. Mic 56-270

THE EFFECT OF "PLACEMENT" AND OF  
"EMPHASIS" ON THE FIRST RESPONSE  
TO A REVERSIBLE FIGURE

(Publication No. 14,669)

Walter B. Simon, Ph.D.  
Indiana University, 1955

The purpose of this study was to investigate some of the factors determining responses to reversible figures. The reversible figure situation was considered to be analyzable into two groups of factors, those influencing the first response, and those influencing the rate of alternation. The present investigation was concerned specifically with factors influencing the first response.

The set of all reversible figures was regarded as a particular subgroup of ambiguous figures. Stimulus objects were considered classifiable on the basis of characteristics (cues) that permit differentiation from other stimulus objects. Furthermore, it was assumed that a subject may assign different verbal responses to each class and that the several responses may vary in the probability with which they are assigned to the particular class. That set of cues which has the highest probability of eliciting a certain response was called the full-cue-object. The probability of a given response to a certain object was considered to depend upon the cue composition of the object and the relation of these cues to those of the full-cue-object of the particular response.

A reversible cube (Necker cube) was regarded as being composed of two simple outline cubes of similar dimensions, in a certain relation to each other. The classes of outline cubes of which the Necker cubes used here were composed are those "facing to the left" and those "facing to the right." It was assumed that previous experience with real and represented boxes would lead (under appropriate instructions) to the response of "left" to the class of outline cubes "facing to the left," and the response "right" to the class of outline cubes "facing to the right."

It was predicted that varying the heaviness of the lines (emphasis) and changing the position of the stimulus figure in the visual field would affect the number of cues available and result in specific changes in the probability of the "right" and "left" responses. Also investigated were the



probabilities of "left" and "right" responses as a function of variations in the size of the figure, on the assumption that different constellations of cues were available in Necker cubes of different dimensions.

Two experiments were performed. In experiment I, twenty male and twenty female undergraduates were shown Necker cubes (of the same size) differing in the placement of heavy lines (either favoring the left or the right alternative), in the pattern of distribution of heavy lines (three patterns were used), and in the position of the stimulus cards (either favoring the left or the right alternative). Every change of position resulted in the subject seeing clearly only a limited part of the stimulus object since he was fixating one of the extremes of the figure. Thus for the left position, the fixation point was 3/16" to the right of the left extreme of the figure; for the right position, the fixation point was 3/16" to the left of the right extreme of the figure. Each of the 12 conditions was presented five times. The exposure time for all figures was .08 seconds.

In experiment II, 25 male and 25 female undergraduates participated; none of these took part in experiment I. In the first part of the experiment, three different dimensions of Necker cubes were used. Each figure was shown to all subjects in two positions (left and right). Each of the six conditions was presented five times. The six simple outline cubes that were the components of the Necker cubes of the first part of the experiment were presented in the second part of experiment II. Each figure was shown five times to each of the fifty subjects. The exposure time was .08 seconds.

The results indicate that both emphasis and placement affect the first response to the Necker cube. This supports the hypothesis that the response to reversible figures is a function of the cues available to the subject. The effect of placement seems of particular importance since this indicates that the first response is directly related to the subject's looking at a certain area of the stimulus object.

53 pages. \$1.00. Mic 56-271

#### THE EFFECTS OF ALTERING TASK COMPONENTS ON LEARNING A PERCEPTUAL-MOTOR TASK

(Publication No. 15,314)

John Allen Whittenburg, Ph.D.  
University of Maryland, 1955

Supervisor: Associate Professor Sherman Ross

The problem was to determine the effects of manipulating different display-control variables of a perceptual-motor task on the acquisition and retention of task required skills, in early and late stages of learning. This problem was delineated into two hypotheses which were experimentally investigated:

- (1) Experimental variation of different display-control functional components during learning on a continuous, compensatory perceptual-motor task has significant and differential effects on the subsequent efficiency of performance on that task.
- (2) Experimental variation of different display-control functional components during learning on a continuous, compensatory perceptual-motor task has

significant effects on the subsequent efficiency of performance as a function of the amount of prior practice on that task.

To test these hypotheses, 188 male military personnel served as subjects, 80 in a preliminary experiment and 108 in the main experiment.

A preliminary experiment was conducted to determine the learning characteristics of different task components and to determine the comparability in overall performance achieved among these task components. Ten subjects were assigned to each condition. Each subject performed on the tracking task for 20 trials. Each trial lasted 1 min. with 25 secs. between trials. Time on target (sec.) and amount of control movement were recorded. Results indicated significant practice effects for all conditions with both measures. All tasks were demonstrated to be comparable in difficulty.

The main experiment involved selection of one of the tasks as the standard task with three experimental tasks selected so that each had only one display-control characteristic different from the standard task. Display-control characteristics that differed for the experimental tasks were Torque, Rate and Directional variables. Nine conditions were investigated, 12 subjects to each. The display-control characteristics were varied early and late in learning. Subjects were divided into two groups, one for early and one for late learning. In a standard condition subjects were administered the standard task during the entire experimental session. There were 35 trials for each subject. In the early learning condition, after five trials on the standard task, display-control variables were altered for five additional trials. The standard task was administered for the remaining 25 trials. For late learning, subjects performed the standard task for 15 trials, on the altered tasks for five trials, and back on the standard task for the remaining 15 trials. Time on target and amount of control movement were recorded.

Results showed that altering different display-control variables early in learning produced initial differential facilitative and interference effects on performance. Changing these characteristics during late learning depressed the first post-trial scores with respect to the last pre-trial. For both early and late learning, these effects were transitory. It was concluded that different display-control interactions differentially facilitate or interfere with performance during initial learning and that the degree of facilitation or interference is related to the perceptual and motor requirements of the task. Changes in display-control relationships during advanced learning serve only to depress performance efficiency temporarily.

113 pages. \$1.41. Mic 56-272



## RELIGION

### THE ATTITUDE OF THE ANCIENT CHURCH TOWARD SICKNESS AND HEALING

(Publication No. 14,173)

Victor Gladstone Dawe, Th.D.  
Boston University School of Theology, 1955

Major Professor: Richard M. Cameron

This dissertation is a historical survey of what Jesus and the Early Church (to 400 A.D.) thought and practiced about sickness and healing.

A major part of the study is concerned with spiritual healing, a manifestation of the healing power of God which the Early Church termed miraculous healing. Those possessing this power were said to have the "gift" of healing. It is not to be confused with what is commonly understood as faith healing, as mere belief in the ability of one to heal. The faith that was a pre-requisite in spiritual healing was understood by the majority in the Early Church as a costly demand, requiring a spiritual transformation that involved a personal commitment to God and a believing relationship with Jesus as the anointed of God.

This healing power of God was manifested in a striking manner in Jesus who, unlike the Jews and most of the Greeks and Romans, did not associate sickness with divine retribution. His healing activity was pursued on the premise that the Heavenly Father willed health of body, mind, and spirit. Thus, Jesus the Healer cannot be dissociated from Jesus the Saviour. His attitude and practice here sets him apart from contemporary non-Christian healers.

Jesus taught that this same power was available to all who were bona fide members of the new kingdom he proclaimed. All of the Apostles and many others in the apostolic age manifested this healing power. In the sub-apostolic age we have few references to spiritual healing in the extant literature, but gifts of the Holy Spirit continued to be bestowed on those who could be effective channels for their use. Among the leading writers of the Ante-Nicene age reference is made to the gift of healing in Justin, Tatian, Irenaeus, Tertullian, Cyprian, Origen, Arnobius and Lactantius. It is also mentioned in the Church Orders of the second, third, and fourth centuries.

Toward the end of the second century we begin to note a decline in the extent and effectiveness of spiritual healing, and this decline has a definite relationship with a loss in spiritual power in the Church in general and in the charismatic ministry in particular. Somewhat allied with the decline was an increase in superstitious practice and a greater respect for and dependence upon regular medicine. Christians began to recognize that normal medical resources should not be shunned as impious but welcomed as a supplement. This attitude was most advanced in the East where Christians became physicians long before they appeared as such in the West. It was the East too that witnessed the first establishment of hospitals which eventually spread throughout the Church.

The most common form of spiritual healing was exorcism, which had little of contemporary magic and superstition. A common practice, also, was the use of elements of the Eucharist and holy oil for therapeutic purposes. In its institutional ministry to the mentally ill the therapy compares favourably with the rehabilitation program in the best of our psychiatric institutions today.

The general attitude toward sickness was close to that of Jesus, but not all was commendable. A shadow cast over its bright record was the obsessive desire for martyrdom, extreme asceticism, and belief in imprecatory sickness manifested by a few overzealous Christians.

On the whole, ministering to the sick was integrally related to the proclamation of the Gospel. The Early Church was able to triumph over all other healing agencies — sacred and secular because of her high moral standards, her altruistic compassion, her absolute certainty in her mission, and the assurance of complete salvation.

226 pages. \$2.83. Mic 56-273

### THE RELATION OF SOME CONCEPTS OF SALVATION AND PSYCHOTHERAPY

(Publication No. 14,174)

Myron Fred Klinkman, Th.D.  
Boston University School of Theology, 1955

Major Professor: Paul E. Johnson

An increasing interest is being shown by theologians and psychotherapists in the relation between religion and psychotherapy. Several attempts have been made by members of both disciplines to show the similarities and differences of religion and psychotherapy in orientations, aims, and techniques. Most of the attempts have followed one of three methods: (1) the comparison of a general concept of religion with a general concept of psychotherapy; (2) the comparison of specific concepts of psychotherapy with a general theological position; or (3) the comparison of specific concepts of religion with a general psychotherapeutic position. This dissertation is concerned with a fourth method — the relation of specific concepts of religion to specific concepts of psychotherapy.

The hypothesis of the study is: there is a correlation between the concepts of Christian salvation held by various religious groups and the concepts of psychotherapy held by various "schools," the correlation depending upon the amount of control exerted over the individual in need of "cure."

To investigate the hypothesis, concepts of salvation held by various religious groups were placed on an authoritarian-liberal continuum. Also, concepts of psychotherapy held by various "schools" were placed on an authoritarian-liberal continuum. Three concepts of salvation were



selected for comparison with three concepts of psychotherapy, the basis for the selection being relative positions on the authoritarian-liberal continua.

"Authoritarian" concepts selected for comparison were those held by Roman Catholicism and the "orthodox psychoanalytic school." "Liberal" concepts chosen for comparison were those held by Unitarians and the "non-directive school" of psychotherapy. These two comparisons were in the nature of a survey. A more thorough comparison was made of "medial" concepts having both authoritarian and liberal tendencies. The concept of salvation held by Lutheranism (represented by Pieper, Aulen, Kantonen, and K berle) and the concept of psychotherapy held by the "interpersonal school" (represented by Sullivan, Horney, Fromm, and Fromm-Reichmann) were used for this comparison.

All of the comparisons were made in three areas: the need for salvation and the need for psychotherapy; the goals of salvation and the goals of psychotherapy; and the processes of salvation and the processes of psychotherapy. A distinct parallelism was found in all three comparisons. The main differences were those which spring from the diverse aspects of religion and psychotherapy.

Roman Catholicism and "orthodox" psychoanalysis express authoritarian tendencies in their basic assumptions concerning man's nature, his difficulties in life, and the processes by which the difficulties are overcome. The tendency to place reliance upon the Church or the psychoanalyst as the effective agent in the process denies the parishioner or patient the right or capacity for self-responsibility.

The survey of liberal concepts revealed an even higher correlation than the authoritarian concepts. The tendency to affirm man's freedom and capacity for self-determination places a premium upon self-reliance.

In the more detailed comparison of medial concepts, similarities were found in the areas of needs, goals, and processes. Both concepts were expressed in terms of interpersonal relations. Sin and neurosis were seen to result in breakdowns of interpersonal relations, and the reconciliations were seen to be effected through interpersonal relations. One significant difference was found. The Lutheran concept of salvation tended to be more authoritarian than the "interpersonal" concept of psychotherapy. Primarily, this was due to the contrasting views of man as totally depraved and essentially good.

The three comparisons gave strong indications that specific concepts of salvation can be correlated with specific concepts of psychotherapy on the basis of the control exerted over the individual in need of "cure." It is hoped that further studies along these lines will depict more clearly the relation between religion and psychotherapy.

273 pages. \$3.41. Mic 56-245

# PROLEGOMENA TO A KOREAN TRANSLATION OF THE BOOK OF ISAIAH

(Publication No. 15,339)

Tae Sun Park, Th.D.

Boston University School of Theology, 1956

Supervisor: Professor Robert H. Pfeiffer

The Korean Version of the Old Testament is inadequate on the following grounds:

1. Hebrew and Aramaic sources were ignored and secondary sources such as the King James Version, the Chinese and the Japanese Versions were used as a basis.
2. Since the beginning of the century both through archaeological research and through the discovery and study of ancient manuscripts, we have access to more and older manuscripts and versions and quotations.
3. Today, we have a better knowledge of the ancient languages and the science of textual criticism.
4. The inadequate understanding of the Korean language by the translators (who were American missionaries) was responsible for the incorporation of many English idioms, rather than Hebrew idioms, into Korean, and textual errors in older versions were perpetuated in the Korean Version. Moreover, the Korean translation was of necessity done in a great hurry, and consequently it is far from perfect.
5. There have been surprising changes in the vocabulary and the usage of the Korean language.

But many Korean Christians have always regarded the first Korean translation as the inspired Word of God and they do not accept even the Revised Version of 1937, saying, "This is not like the Bible." Those who have the English "Revised Standard Version" in their libraries in Korea are regarded as "heretics"; for "a virgin" in Isaiah 7:14 is translated "young woman" in the Revised Standard Version. Many of them do not know the fact that the Korean Bible is a translation of the Hebrew Bible into the Korean language.

The purpose of this study is to stimulate Korean Christians, hoping that someday they may have a new Korean version, translated directly from the original Hebrew and Aramaic in the light of modern textual criticism.

By way of background materials the first five chapters are devoted to summarizing the Hebrew Text, the Targum, the Septuagint and other Greek Versions, the Dead Sea Isaiah Scroll and the King James Version. This does not aim to be original, but draws upon the standard works in the field.

The main part of this study is given in the last two chapters. By way of orientation a chapter is devoted to the Korean version, including the Korean language, a historical survey of the Korean version, and critical evaluation of the present Korean version, and the need for a new translation.

Since this is a vast field of research, the dissertation is concentrated on the Book of Isaiah. The inadequacy of the present Korean Version is demonstrated by a critical analysis of twenty crucial passages; for example,

1. The Tetragrammaton, Yahweh
2. 7:14, Ha almah

By the help of ancient versions such as Septuagint, Aquila, Theodotion, Symmachus, the Vulgate, the Targum,



Syriac, and some modern translations such as the Revised Standard Version, James Moffatt's translation, J.M.P. Smith's translation, German, Japanese, Chinese Versions, the present writer has tried to reconstruct the original text as accurately as possible.

All the available commentaries were consulted. The Dead Sea Isaiah Scroll was carefully examined. Two chapters (6: 1-13; 52:13-53:12) of a model translation in the Korean language are submitted.

In the two sample chapters of the New Translation seventy emendations were made, averaging nearly three emendations in each verse. This also shows that the Korean Version is not quite adequate.

It is plain that no translation of the Bible is final, even though it may be a more accurate one translated in a more understandable and modern language than any preceding translation.

The present writer indeed hopes that the present study makes a small contribution to Biblical studies in Korea and in the East.

253 pages. \$3.16. Mic 56-274

#### THE DEVELOPMENT OF SCHOOLS UNDER THE KOREA MISSION OF THE PRESBYTERIAN CHURCH IN THE U. S. A., 1919-1950

(Publication No. 15,109)

Peter van Lierop, Ph.D.  
University of Pittsburgh, 1955

The purpose of this study was to trace the development of primary, secondary, and higher schools under the Korea Mission of the Presbyterian Church in the U. S. A., beginning with the rise of the Independence Movement, also known as the "Rebirth of Korea," in 1919, and ending with the outbreak of hostilities in Korea in 1950. The schools above primary level considered in this research comprised 13 academies, 16 Bible institutes, three colleges, three seminaries, and three nurses' training schools.

The major sources were of primary nature. Chief among these were the manuscripts in the archives of the Board of Foreign Missions of the Presbyterian Church, U. S. A., in New York, and which included the following: (1) annual reports of the schools, (2) annual mission station reports, (3) annual personal reports of the missionaries, (4) correspondence of the field administrator with the Board of Foreign Missions, and (5) letters from experts visiting the field. Other primary sources were found among the published (1) Annual Mission Minutes and Reports, (2) Minutes and Reports of the Executive Committee of the Mission, (3) Annual Minutes of the Council of Presbyterian Missions in Korea, (4) Reports of the Board of Foreign Missions to the General Assembly of the Presbyterian Church, U. S. A., and (5)

Annual Reports of the Government-General of Chosen.

This study disclosed four clearly defined periods in the development of schools. (1) The first period, extending from 1919 to 1924, had a natural beginning in the Independence Movement. This event instigated new educational reforms on the part of the Japanese government. The period was characterized by a great influx of students and a reawakening of interest in education. (2) The second period, 1925-1933, was influenced by the requirement of the government that mission schools must obtain "designation," in order to qualify for equal standing with government schools and at the same time retain Bible instruction in the curriculum. During this time the mission schools put forth strenuous efforts to raise their standards. (3) A period of gradual closing of mission schools resulted from the government's requirement that all schools partake in the patriotic ceremonies at the Shinto Shrines, 1934-1945. (4) The period of restoration, 1945-1950, came about under the United States Army Military Government in Korea and the Republic of Korea after the surrender of Japan. This new era started with the abolishment of the Japanese educational system and with the introduction of the "democratic way of life."

The following major conclusions seem justified:

1. Japan's policy of assimilation was aimed at making loyal citizens of the Koreans but actually had the opposite effect.

2. The Korea Presbyterian Mission has been quite successful in its policy of training leaders and placing them in administrative positions in the schools.

3. The Korea Mission met with fair success in its central policy of educating the children of the church rather than using education to further directly its program of evangelism. The Mission's insistence on an all-Christian faculty and a majority Christian student body has worked out well and has resulted in a strong Christian leadership trained to evangelize its own people and to apply the principles of Christ to Korean community life.

4. In maintaining a Christian school the Mission did not sacrifice quality for doctrine but aimed at the best, striving at least to equal what the government offered.

5. It is the opinion of the writer that the Bible institutes could improve their program of studies by adding several courses in religious education. If the Bible institutes are to continue to make a large contribution toward meeting the needs of trained lay leadership in the church and maintain standing in this "new day in Korea," higher standards will be needed and the curriculum must be expanded to attract many of the brighter young students who would otherwise be lost to the church.

276 pages. \$3.45. Mic 56-275

## SOCIAL PSYCHOLOGY

### A COMPARISON OF THREE METHODS OF OPINION POLLING

(Publication No. 13,812)

Richard Frank Bromer, Ph.D.  
Purdue University, 1948

Major Professor: H. H. Remmers

Some pollers have contended, others have denied, that using depth interviews produces different average results from using straight interviews. In this study we sought to answer this question: If scores are assigned to respondents' answers according to their positions along a favorable-unfavorable, attitude continuum, will there be significant differences among the mean scores of the answers obtained by using straight interviews, secret ballots, and depth interviews?

A heterogeneous group of twelve, polling questions was ranked by judges from the question on which they expected the least difference to that on which they expected the greatest difference to occur between average, public and average, private attitude.

Three groups of one hundred and ninety-two respondents each from the residents of Lafayette, Indiana, were interrogated by each of the three methods, respectively. Each group contained twelve respondents in each of the sixteen possible combinations of the four, dichotomized factors: income, age, sex, and interviewer. By employing a factorial design we were able to study not only over-all differences between any two methods, but also the interactions of method with income, age, sex and interviewer.

Only one significant, over-all difference was found. Respondents who filled out secret ballots expressed a stronger preference for private employment over government employment than the respondents interviewed in either straight or depth interviews. Several significant interactions indicated that public attitudes are not constant throughout a population but vary among various sub-groups of the population. Other significant interactions indicated that the interviewer's bias had fuller play in the depth interviews than with the other two methods.

The pooled judgments of psychologists were found to be inadequate for predicting differences between the straight and secret results. Predicting where differences will occur between the average results obtained by these three methods is a task which can be accomplished only through highly specific experiments. 135 pages. \$1.69. Mic 56-276

### A COMPARISON OF FALSE NONAUTHORITARIANS IN TWO ETHNIC GROUPS

(Publication No. 15,468)

Miriam E. Koontz, Ph.D.  
George Peabody College for Teachers, 1955

Major Professor: Nicholas Hobbs

This study was oriented in the authoritarian personality theory of Adorno, Frenkel-Brunswik, Levinson, and Sanford. Theoretical reasons were suggested why the F (Fascism) scale failed to identify certain authoritarians. The unidentified authoritarians are those individuals who will not give "lip service" to authoritarian statements, but who exhibit authoritarian personality characteristics in non-self-report situations. The authoritarian personality characteristics chosen to use in this study were intolerance of ambiguity as measured by the combined Thurstone Concealed Figures and Gestalt Completion tests, anti-intracception as measured by the Sentence Completion Test, and extrapunitive as measured by the Rosenzweig Picture-Frustration Study.

Reasons were offered why a minority group, specifically a Negro group, would have a larger proportion of authoritarians who are not identified by the F scale than a majority group, a white group comparable socio-economically and educationally to the Negro group.

The subjects were 141 undergraduates from Fisk University and 151 undergraduates from George Peabody College for Teachers.

The individuals who identified themselves falsely on the F scale were called false nonauthoritarians. A false non-authoritarian was defined as an individual who scored in the bottom 27 per cent of his sample on the F scale, but did not score on the bottom 27 per cent on any other measure. A true nonauthoritarian was an individual who scored in the bottom 27 per cent of the F scale and also in the bottom 27 per cent on any other measure, but not in the top 27 per cent on any measure. A true authoritarian was an individual who scored in the top 27 per cent on the F scale and the top 27 per cent on at least one other measure, but not in the bottom 27 per cent on any measure. A false authoritarian was an individual who scored in the top 27 per cent on the F scale, but was not in the top 27 per cent on any other measure.

To increase the possibility that authoritarians would identify themselves, a behavioral test was given. Subjects were given a word definition test under two conditions: one nonstress and one stress. It was thought that the addition of stress would so threaten authoritarians that they would respond by significantly varying their performances from the nonauthoritarians.

The following hypotheses were tested:

1. The proportion of Negro false nonauthoritarians will be greater than the proportion of white false nonauthoritarians from comparable socio-economic and educational groups.



2. Subjects with the pattern of false nonauthoritarians will perform less efficiently under stress than will true nonauthoritarians.

3. Subjects with the pattern of false nonauthoritarians and true authoritarians are affected in the same way under stress.

The results were negative. The proportion of Negro false nonauthoritarians was not greater than the proportion in the white sample. Subjects with the patterns of false nonauthoritarians, true nonauthoritarians, false authoritarians, and true authoritarians all performed alike under stress since no significant differences were found between their mean performances.

A difference significant at the .05 level between the means of the Fisk and Peabody groups was found only on the measure

of extrapunitive, the Rosenzweig Picture-Frustration Study.

The measures of authoritarianism, intolerance of ambiguity, anti-intracception, extrapunitive, and socioeconomic status did not correlate significantly for the total sample.

The following suggestions were offered as tentative explanations for the negative results obtained: differences between the clinical and objective methodologies, errors in measurement, and theoretical overstatements in the authoritarian syndrome.

General test sophistication of the subjects and an experimental situation which did not actually produce stress were offered as additional explanations for the failure to confirm hypothesis two and the insufficient evidence to reject hypothesis three. 107 pages. \$1.34. Mic 56-277

## SOCIAL WORK

### TRANSPPOSED FACTOR ANALYSES OF NORTHWEST AND SOUTHEAST COUNTIES OF MISSOURI IN RESPECT TO CERTAIN SOCIAL AND ECONOMIC CONDITIONS IN 1940 AND 1950

(Publication No. 15,173)

Mohsen Abd Elhamid Ahmed, D.S.W.  
Washington University, 1955

This study represents an attempt to apply the relatively new method of multiple-factor analysis, developed in the field of psychological research, in the field of social work research. The basic objective was to determine the extent to which thought-to-be different groups of counties, with respect to certain social and economic conditions, do represent a type or types of counties, and what basic or underlying similarities and differences characterize these types.

To achieve the goal of this study two groups of counties in the State of Missouri, which were found by a previous study to differ considerably in regard to social and economic conditions, were selected for analysis. Seven northwestern counties constituted the first group, and seven southeastern counties constituted the second group. Forty-five variables were selected from different sources to reflect social, economic, health, and political conditions of the counties in 1940 and 1950.

The transposed factor technique was utilized to obtain the necessary correlation matrices by computing the product-moment correlations among the selected fourteen counties in respect to the selected forty-five variables. The group centroid method of factor analysis was the main procedure of factor extraction from the obtained correlation matrices of 1940 and 1950. The grouping method of factor analysis was applied to the 1940 correlation matrix in order to ascertain whether the factor solution of this study would be invariant in relation to the application of different procedures of analysis.

Three factors indicating different types of counties were extracted by the group centroid method from each 1940 and 1950 correlation matrix. In order to identify these types by which the selected counties were differentiated on the basis of the selected variables, an attempt was made to interpret the types extracted from 1940 and 1950 matrices.

The first type was identified mainly in terms of fifteen variables reflecting the ratios of economic resources to inhabitants, level of consumption, educational level, fertility, and political participation. This type may be reasonably named Higher Economic-Educational Level versus Lower Economic-Educational Level.

The second type was identified in terms of five variables. This type may be reasonably named Urban-Industrial versus Rural-Unindustrial.

The third type, which contributed very little to the total covariance of the fourteen counties, was evidently unstable between 1940 and 1950 and seemed too diverse to support any adequate factor definition.

It is emphasized that this study is an exploratory one, concentrating upon a relatively few variables and units. Thus, further attempts need to be made with wider collection of variables and units before types of geographical areas can be adequately identified.

132 pages. \$1.65. Mic 56-278

## SOCIOLOGY

### SOCIOLOGY, GENERAL

#### A FOLLOW-UP STUDY OF CERTAIN WHITE MALE DELINQUENTS IN PITTSBURGH

(Publication No. 15,087)

Francis Ramon Duffy, Ph.D.  
University of Pittsburgh, 1955

This study was designed to ascertain and analyze the degree of socially acceptable or unacceptable adjustment of 128 delinquents, seven years after their cases were closed by final hearings at the Juvenile Court of Allegheny County, Pennsylvania. The study was delimited to a consideration of white, male, city-residing delinquents, 14 years of age or older, whose cases were given final hearings during the period between January 2, 1948, and May 31, 1948.

A review of the literature, relative to follow-up studies, was undertaken in order to ascertain the procedures most favored by those who made major contributions in developing ideational frameworks and research designs in the area of delinquency follow-up studies. A small sample survey was also initiated in order to determine the current practices of juvenile court judges, relative to investigations of the after-careers of former delinquents. All 31 juvenile court judges agreed on the need for such studies as a useful tool in estimating the effectiveness of various forms of treatment.

The primary device used for gathering data was the personal interview with each subject when possible, or with family members. Collateral interviews and conferences were held with persons in each subject's strategic environment, including juvenile and adult probation officers, officials in the city, county and state, staff members of 31 agencies and institutions, teachers, counselors and principals in 55 schools, and with various clergymen in the city. Juvenile court records, school records, police files, court documents, and institutional case histories were consulted, prior to home visits.

It was discovered that 109 of the subjects made a socially acceptable adjustment at the adult level; the other 19 subjects did not. All data relative to these two groups were then analyzed. Particular emphasis was placed on examining the relative influence of the following factors: age-grade placement in school, retardation, academic grades, subjects repeated, attitudes toward school, teachers, and classmates, ability, intelligence, effort, truancy, transfers, and citizenship ratings. Juvenile court experiences were then examined, relative to the age at first delinquency, number and nature of delinquencies, dispositions, and terminal adjustment at the time of case closings. Family, community, employment, religious, marital, military, and civic relations were analyzed, relative to those subjects who did not adjust, and to those who did.

The evidence gathered and analyzed seemed to indicate that those subjects who did not adjust were more apt to be found suffering from a complex of handicaps originating in

mental, emotional, and personality deficiencies, poor family and community relations, poor school relations, difficulties in obtaining employment, and poor social development. While the adjusted subjects had many of the same handicaps, they had certain offsetting qualities that enabled them to take advantage of community-provided opportunities. The principal contribution to sociological theory resulting from this study was the fact that delinquents who become criminals give adequate warnings, in early youth, of the probable course of later adjustments. Second, the evidence suggests that the Juvenile Court System is doing well what it was conceived to do, for those children who are amenable to its ministrations. Further research will be required, in order to discover techniques that will enable parents, teachers, clergymen, group work leaders, and others, to do what is necessary to avoid producing delinquent personalities of the type that juvenile courts simply cannot be expected to treat successfully.

157 pages. \$1.96. Mic 56-279

#### MOBILITY AND OCCUPATIONAL ROLES: A COMPARATIVE ANALYSIS OF SALESMEN, BANKERS, AND ENGINEERS

(Publication No. 15,151)

Raymond John Murphy, Ph.D.  
Northwestern University, 1955

Chairman: Raymond W. Mack

At present we possess no coherent theory of occupational mobility in American sociology. Although a number of studies have been undertaken in an attempt to explore the amount of mobility in the American society, relatively little research has been concerned with an analysis of the correlates of mobility. The present study represents an attempt to investigate the relationship of certain attitudinal and structural variables to occupational mobility in sales, banking, and engineering. It is the major purpose of the study to suggest potentially useful areas for further research in the hope that a theoretical framework may eventually be constructed.

Two current areas of research interest form the basis for the study: the occupational role approach, which places emphasis on the nature of occupation as a determinant of human behavior, and the mobility type approach, which sees change in status per se as the significant differentiator of behavior.

The data were obtained from personal history forms filled out by 2205 salesmen, bankers, and engineers representing a cluster sample of companies within the appropriate industry classifications of the United States Census. Two types of mobility were investigated: father-son, and career, and two measures of each type were employed:



the Edwards socio-economic scale, and the Warner-McGuire adaptation of the Edwards classification. For both types of mobility, and utilizing both measures, individuals within each occupation were classified as upwardly mobile, non-mobile, and downwardly mobile.

Sixteen dependent variables were chosen for study. They include the kind and amount of high-school and adult voluntary associations participated in by the respondents, favorable and unfavorable attitudes toward each of the occupations in the two or three job history of each individual, and a number of items relating to plans for the future, income aspirations, and salary mobility.

Using age groups (under 35 years, and 35 or over) as a control, the following major null hypotheses were tested:

Among individuals classified as occupationally upwardly mobile, non-mobile, or downwardly mobile, there will be no statistically significant differences in the attitudinal and voluntary associational variables tested.

There will be no statistically significant differences in the attitudinal and voluntary associational variables tested among the individuals classified as salesmen, bankers, and engineers.

Chi-square tests were run on each variable for the mobility comparisons (within each occupation) and the occupational comparisons (within each mobility group).

The findings indicate a general lack of significance between mobility direction and the voluntary associational, work attitude, and aspirational variables. In terms of the father-son type, favorable attitudes toward the present job and salary aspirations, alone, seem to be differentiated by mobility direction. For the career type, only three variables show significant relationships: present income, salary mobility, and income aspirations. The latter set of findings suggests a relationship between occupational career mobility and income.

In contrast, the occupational tests indicate a close relationship between occupational role and the dependent variables. Only with regard to the number of high-school extra curricular activities and unfavorable attitudes toward the present and third jobs do the occupations of the respondents fail to suggest significant differences. The patterns of responses to the significant variables show consistent occupational differences regardless of mobility type, mobility direction, mobility measure, and age group. Such findings indicate the importance of occupational role in the differentiation of the attitudinal and structural dimensions considered in this study.

The findings suggest that we re-examine mobility in terms of occupational reference groups. It is hypothesized that vertical mobility represents a component of occupational role expectations. In order to test this notion a typology of role expectations is presented and an investigation of such components using existent occupational role typologies is suggested. The implications of occupational role expectations and mobility are suggested for the study of family behavior, character study, stratification and mobility theory, and social disorganization. 264 pages. \$3.30. Mic 56-280

## SOCIAL MOBILITY AND FAMILISM

(Publication No. 15,172)

Seymour Yellin, Ph.D.  
Northwestern University, 1955

Chairman: Raymond W. Mack

This study deals with the relationship between social mobility and familism. The research is performed on a sample of 1416 white, urban, married males, divided into three occupational sub-samples: salesman, engineers, and bankers. Familism is defined in structural terms; it denotes degree of objective involvement in the family of procreation. Four variables are used as operational measures of degree of familism: age at marriage, childless time span, number of children, and housing status. Occupation is used as the criterion of position for the purpose of measuring social mobility. Intergenerational mobility scores are obtained by combining occupations into a hierarchy of levels based on the Edwards Census Bureau classification.

The central hypothesis is: degree of upward social mobility and degree of familism are inversely related; degree of downward social mobility and degree of familism are directly related. On the basis of current opinion concerning the relationship between social mobility and familism two polar types of individuals are posited: family-oriented and career-oriented. It is hypothesized that those characterized by high familism should score relatively low on age at marriage, childless time, and housing (home owner or home renter), and relatively high on number of children; those characterized by low familism (presumed to indicate a career orientation) should score relatively high on age at marriage, childless time, and housing (apartment or room occupant), and relatively low on number of children.

In view of their known influence upon the measures of familism and mobility the following secondary variables are used as controls: age, education, socio-economic origin, and fertility of family of origin. Correlation analysis is used as the main statistical technique to test the general hypothesis. Housing status did not provide a suitable metric and therefore chi-square analysis is used for this variable.

Zero-order correlation matrices are computed for six sub-groups of the sample: each of the three occupations split into two mobility groups, non and upwardly mobile, and downwardly mobile. Occupation is held constant so as to control for possible effects of the division of labor, while mobility is dichotomized in order to determine whether the same factors are interrelated in a similar pattern for groups of differential occupational movement.

In general, the six matrices conform to a similar pattern. Most of the direct relationships between the familism variables and mobility are at or near the zero point. While many of the associations are statistically significant at the 1 and 5 percent levels, in almost no case do they account for a sociologically meaningful proportion of total variation. Various partialing efforts fail to raise the relationships to any important extent.

In view of the current wide acceptance of the social mobility and familism frame of thought, the research structure is reexamined in the light of the rejection of the hypothesis. Seven classificatory and statistical modifications



are introduced into the design. These alterations lead to a confirmation of the basic findings.

The theory of familism and social mobility is reviewed in the light of the statistical findings of the study and of related sociological theory. The rationale for the rejection of the theory is discussed in terms of two main considerations: (1) voluntaristic social options versus determination by life-chances, and (2) historically specific validity related to (a) narrowing of movement into the entrepreneurial stratum, (b) bureaucratization of business units with concomitant changes in employers' value-system, and (c) stage of the business cycle. The degree of contemporary validity of the theory is dependent upon a number of suggested theoretical and methodological qualifications in the formulation of the hypothesis.

151 pages. \$1.89. Mic 56-281

## SOCIOLOGY, COMMUNITY ORGANIZATION

### INDUSTRIAL MANAGEMENT FOR FEDERATED FUND-RAISING: A PHILADELPHIA STUDY

(Publication No. 15,327)

Demetrius Stavros Iatridis, Ph.D.  
Bryn Mawr College, 1955

The study, financed by the Community Chest and the United Fund of Philadelphia, was designed to provide information for the solution of some of the most urgent leadership problems of the two federations. Its aim was (1) to describe quantitatively the current executive management of the United Fund and the Community Chest of Philadelphia; (2) to establish a definition of the type of individual sought for recruitment of leadership from industry; (3) to identify the industrial sources in Philadelphia which could provide potential leaders for the executive management; and (4) to formulate a device for comparative evaluations of leadership contributions from industrial sources.

The method adopted in the study consisted of two main procedures: analysis of the records of the two federations, and collection of data through questionnaires. The first procedure was concerned with the description of the current executive management, the definition of the potential leader for recruitment, and the measurement of the number of leaders who satisfied the definition and were engaged in the executive management. The second procedure was concerned with the estimation of the number of potential leaders available in Philadelphia industry, and the establishment of devices for comparative evaluations of leadership contributions. Part One of the dissertation enlarged on the developments of federated fund-raising, offering a frame of reference for the study. Part Two described local developments and presented the study, its findings, and a proposed method for the evaluation of leadership contributions from industry.

The findings of the study revealed that the executive management of both the United Fund and the Community Chest represented predominantly the interests of industrial groups. Social welfare agencies, organized labor, and other community groups were insignificantly represented. The leadership of the two organizations consisted primarily of senior executives of large industrial establishments who were

delegated major responsibilities in policy-making committees. The administrative position an executive held in his establishment and the size of the establishment with which he was affiliated seemed to influence his role and responsibility as a leader of the two federations. The lower the administrative position of the executive in his establishment, the greater the tendency to designate him to committees with little or no policy-making power. Large industrial establishments provided the greatest number of executives for the leadership of the two federations.

Analysis and interpretation of the findings identified the criteria used for the selection of industrial leadership. The definition of the potential leader, based on the criteria thus established, was used to measure the number of leaders who satisfied the definition and served with the two federations, and to estimate, through stratified random sampling, the number of potential leaders available in Philadelphia industry.

The objective comparison of the number of leaders provided by industrial sources required the establishment of measuring devices. The study formulated an "All-Industry Ratio" and a "Fair Share Yardstick" which were utilized for the evaluation and comparison of leadership contributions from industry. The yardsticks can be utilized successfully, also, for identifying those sources which provide a smaller or greater percentage of leaders than their fair share; for serving as a convincing device for increasing leadership contributions from industry; for attaining better balance of representation of industrial interests; and for distributing more evenly among industry the responsibility of providing community leadership.

263 pages. \$3.29. Mic 56-282

## SOCIOLOGY, FAMILY

### A STUDY OF SECULARIZATION IN THE RURAL PROTESTANT AREAS OF ISABELLA COUNTY, MICHIGAN

(Publication No. 14,270)

Willis James Dunn, Ph.D.  
Michigan State University, 1955

This is a study of the impact of complex, modern, technologically stimulated patterns of behavior, upon the hierarchy of importance given to intuitive and empirical value-judgments in their orientation to daily life.

A review of the literature prompts the assumption that secularization is a social process, that secularization is not new, and that, as a social process, secularization takes place in a social situation in which there are discernable and measurable trends in overt behavior patterns.

On the basis of these assumptions three hypotheses are advanced, namely: (1) that secularization can be defined and related to a logical continuum between the poles of the spiritual and the secular, and to which continuum overt practices can be measurably related; (2) that specific overt behavior patterns which are sanctioned, encouraged, and endorsed by organized religion can be used as an index and arranged on such a logical continuum; (3) that by a



scoring procedure this index can be measurably related to the continuum and a measure of the degree of congruity between the frame of reference of the study and family groups can be established.

The data upon which this study is based, was gathered by fielding a pre-tested schedule in the rural Protestant areas of Isabella County, Michigan. Responses were placed on International Business Machines' cards and results tabulated. On the basis of these tabulations the data were analyzed in terms of secularization scores established for each family. Families were then grouped according to various factors covered by the schedule. These groups were compared on the basis of mean score ranges and averages.

Theory and logic for the analysis of the data was drawn from the sociology of religion, social psychology, and the theory of the measurement of value. In the light of these theoretical and logical theorems certain statistically significant results were found which led, among others, to the following conclusions:

1. Church and non-church families were consistently different in mean scores, although church membership itself was not a scored item;
2. The same social, economic, and cultural factors were found to effect the church family differently from the non-church family;
3. There is a relationship between willingness to sacrifice for a religious value, or to exercise self-discipline for a religious value, and secularization.

174 pages. \$2.18. Mic 56-283

#### A STUDY OF ROLE AND AUTHORITY PATTERNS AND EXPECTATIONS IN A GROUP OF URBAN MIDDLE-CLASS TWO-INCOME FAMILIES

(Publication No. 14,690)

Everett Dixon Dyer, Ph.D.  
The University of Wisconsin, 1955

**Purpose of the study.** The study was motivated by this general question: In view of changes presumably taking place in American society, and in American families in general, what particular changes and developments may be taking place in the rapidly increasing urban, middle-class family where the wife as well as the husband is employed? Is this family becoming partnership and equalitarian in role and authority patterns?

The main purpose of the study is to determine the extent to which a group of urban, middle-class, two-income families manifest "partnership-equalitarian" role and authority patterns and expectations in three role areas: (1) homemaking, (2) social participation, and (3) family providing and financing. Additional aims of the study are: (1) to find out if the role and authority-expectations of the marriage partners are consistent with their actual performance or action patterns; (2) to see if differences exist between the role and authority-expectations of husbands and wives; and (3) to determine what relationships exist between (a) the family role and authority patterns and expectations and (b) a number of personal, social, and background variables.

**Sample and method.** Information for the study was obtained by questionnaires presented to the wives in 129 families living in Madison, Wisconsin. In these families both husband

and wife were employed and were living together, one or both had a white-collar occupation, at least one mate had a minimum of high school education, and the family had middle-class status.

A typological method was used in analyzing the data. "Traditional" and "partnership-equalitarian" family types were constructed, embracing the probable extremes of family role and authority patterns and expectations which might be found in American family culture. The group of 129 families were then examined for the rate of incidence and degree of approximation to the partnership-equalitarian family type.

#### Summary of findings:

1. The data indicated a definite, if uneven, trend toward partnership role performance patterns in the three role areas. Husbands and wives were found to do the most sharing in the area of social participation, and the least in the area of homemaking.
2. The data showed a high degree of "equalitarianism" to exist in the authority patterns in these families. Family decisions are made jointly by the husband and wife, and disagreements are settled on a 50-50 basis. The findings suggest that this type of two-income family had become essentially emancipated from traditional patriarchal authority patterns.
3. The data failed to show a significant difference between actual role performance patterns and role-expectations. Moreover, no significant difference was found between actual authority patterns and authority-expectations. These findings suggest that in these two-income families the husbands and wives have become equally as emancipated from traditional conceptions of "woman's place" and "man's place" in the family as they have from traditional role practices and patriarchal exercise of authority.
4. Wives were found to be somewhat more partnership in role-expectations than their husbands, but no significant differences were found between the authority-expectations of the husbands and the wives. The data suggest that husbands as well as wives feel that an equalitarian exercise of authority in the family is right and proper.
5. Associations were found between partnership-equalitarianism and: (1) favorable attitudes of the wife toward her employment, (2) a relatively high education for the husband, (3) relative youth of the wife, (4) the absence of children in the family, and (5) relative "youth" of the marriage, in terms of years married.
6. No associations were found between partnership-equalitarianism and: (1) steady employment of the wife either before or after marriage, (2) relatively permanent work-expectancy of the wife, (3) the wife's working for personal interest reasons rather than because of economic necessity, (4) the husband and wife being in the upper occupational and income levels, (5) favorable attitudes of the husband toward his wife's employment, (6) the relative youth of the husband, and (7) a relatively high education for the husband.
7. Marital happiness was found to be greatest in those families that had become the most partnership-equalitarian. Marital happiness was also found to be associated with (1) close agreement of the husband and wife in both role and authority-expectations, and (2) the employment of the wife being motivated by personal interest rather than economic necessity. Contrary to expectations, marital happiness was not found to be related to favorable attitudes of either the husband or the wife toward the wife's being employed.

242 pages. \$3.03. Mic 56-284



**THE RELATIONSHIP BETWEEN TENDENCY TO  
EXPRESS OR NOT EXPRESS HOSTILITY  
AND MARITAL SUCCESS**

(Publication No. 15,420)

Sylvia Turlington O'Neill, Ph.D.  
Cornell University, 1955

The goal of modern marriage is often said to be personality development and fulfillment. Marital success schedules generally attempt to measure "happiness" or "adjustment," but past research does not tell us whether these states always indicate family atmospheres conducive to personality development. Questionnaires commonly fail to distinguish biased from truthful answers. Moreover, the principal criterion of marital success — lack of conflict — is psychologically unsound. There is considerable theoretical basis and clinical evidence that overavoidance of conflict is a neurotic tendency hindering personality development. Many writers on marriage believe that a moderate amount of conflict may actually strengthen relationships and aid marital adjustment. In successful marriages, occasional conflict may lead to greater mutual understanding, solution of incipient problems, tension release, and generally greater interaction.

This study compares the marital success of individuals who tend to express hostility fairly freely with that of persons who tend to inhibit (not express) hostility. The subjects were 64 graduate-student couples under age 35, half of whom were parents. Length of marriage ranged from five months to fourteen years (average 3.8 years).

Tendency to express or inhibit hostility was rated from stories written in response to four "loaded" drawings, depicting a young couple showing various degrees of anger at each other. The subjects were grouped in approximate quartiles according to the sum of their expressiveness ratings for all four pictures.

The first (Low) and third (High-moderate or HM) quartiles are the focus of this study. These groups had similar high Marital Success mean scores on a standard schedule. A general hypothesis was that Low expressers hold "conventional" values (marital harmony and unity), whereas HM expressers — being less upset by dissension — value "companionship" aspects. The HM's were expected to fit, better than the Lows, the following psychological criteria of a successful marriage which would encourage personality development of family members:

Feelings of happiness

Understanding of partner

Accepting separate individuality of partner

Tending to regard partner and self as equals

Valuing companionship over consensus (agreement)

On self-rated happiness, Lows and HM's were high and similar.

Degree of understanding of partner was estimated from accuracy of predicting partner's answers on an attitude scale. Lows were less accurate than HM's, suggesting that "emphatic" understanding may be associated with expressiveness. Among Lows, incidentally, longer-married subjects were less accurate, possibly having built up consistent false impressions over time.

Lows and HM's perceived equal amounts of self-mate personality difference on a fifteen-trait rating schedule. Lows were happier the less difference they perceived; happiness was independent of perceived difference for HM's.

Most subjects thought their partners had "better" traits

than themselves. Among Lows only, happiness was associated with an attitude of greater humbleness, possibly indicating insecurity. For HM's, happiness was associated with greater equality.

The relative importance to Lows and HM's of "Consensus" and "Companionship" (parts of the marital success schedule) was estimated from correlations of these scores with Happiness scores. Comparisons of correlations indicated that Lows value consensus more than do HM's, and more than they value companionship; HM's value companionship more than do Lows, and more than they value consensus.

Marital happiness and reported parental conflict were not related for the whole sample. Lows were happier if they reported no parental conflict. HM's reporting some parental conflict were happier than Lows reporting some conflict. Possibly HM's are less influenced by past experiences.

It was concluded that a tendency to express hostility is associated with greater marital success than is a tendency to inhibit hostile expression, when success is judged by certain psychological criteria.

178 pages. \$2.23. Mic 55-285

**SOCIOLOGY, PUBLIC WELFARE**

**A COMPARATIVE STUDY OF THE PUBLIC  
RELATIONS PRACTICES OF SIX  
INDUSTRIAL CORPORATIONS**

(Publication No. 15,113)

Frederic Rhodes Henderer, Ph.D.  
University of Pittsburgh, 1955

World War II brought into sharp focus the need for industry to develop and maintain a more favorable public attitude towards its management and the manner in which it conducts its business. Prior to the War much had been done to establish two-way communication between management and the employee, and management and the stockholder, but little consideration had been given to relations with the general public.

In the decade following the War, considerable headway has been made toward developing a sympathetic public attitude by the formulation of public relations programs and the provision of a staff as part of the managerial structure of many industrial corporations. With exceptions, however, each corporation has paid little attention to the practices and procedures used by other corporations. We believe that this apparent disinterest derives principally from the fact that one corporation has been reticent about telling another what it is doing to promote public acceptance of its own policies.

To determine whether these public relations programs follow a general pattern of administration, or whether, having developed spontaneously, they differ materially in their conception and application of the principles of good public relations techniques, six corporations with



headquarters in Pittsburgh, Pennsylvania, were selected for examination. It was felt that if these six national corporations, which had developed programs independently of each other, were administering them along the same general lines, it could be assumed that the "scientific method" was being developed and applied to public relations practices as it has been applied to other management functions.

Consequently, in the selection of the companies to be investigated, diversification of both product and consumer market was considered necessary. The six companies selected were the United States Steel Corporation, Aluminum Company of America, The Westinghouse Electric Corporation, Pittsburgh Plate Glass Company, Koppers Company, and the Dravo Corporation. Five companies were selected because they were national in scope and represent completely different products: steel; aluminum; electrical appliances; paints, glass and chemicals; and heavy equipment and other capital goods. The Dravo Corporation was included because it uses many of the basic commodities manufactured by the other companies; yet it is small enough to offer a comparison between the public relations policies of a small company and that of the larger industries.

The study was made both by personal contact with public relations staff executives and by the use of printed materials

and records submitted by the companies. After each company's program was written, it was submitted for review.

The study analyzes the manner in which the companies administer their public relations programs in terms of the following general divisions: organization; public relations objectives; publics served; media used; plant community relations; educational activities; employee information; and product publicity.

Although each company had used public relations techniques to meet individual conditions that were not necessarily a part of other companies, all of the companies, working independently of one another, developed the same general policies and procedures in the administration of their public relations programs.

The study makes an analysis of similarities and differences in the six programs. A section then discusses the measurement of public opinion as it relates to industry and plant communities, and a "Suggested Public Relations Program to Meet Major Company Requirements" follows.

The Appendix contains a detailed description of each company's public relations policies and procedures.

272 pages. \$3.40. Mic 56-286

## SPEECH — THEATER

### DRAMATIC ACTIVITY IN THE COLLEGES AND UNIVERSITIES OF THE UNITED STATES PRIOR TO 1905

(Publication No. 15,361)

John Lewis Clark, Ph.D.  
Stanford University, 1955

There is little evidence of play production in American colleges before 1750, although William and Mary witnessed some sort of dramatic activity in 1702. The traditional Puritan opposition to the drama effectively prevented plays at most of the colonial colleges prior to the middle of the eighteenth century. Although antagonism to the professional theatre remained implacable, there was a noticeable increase in collegiate dramatics in the latter part of the eighteenth century.

The drama appears in the colleges of this period in several well-defined forms. As "academic exercises," the performance of classical dramas seems to have been used to stimulate student interest in and to aid in the teaching of Latin. Extracurricular plays were not lacking, however, as is proved by the comparatively extensive program of plays presented by the early literary societies, especially those at Yale. Even in those colleges where literary societies did not produce plays, student initiative overcame the difficulties on occasion, and productions were given. A general interest in the drama by college students is evidenced by entries in letters and diaries of the period. Commencement plays and "dialogues" constitute a third category of eighteenth century college drama.

College dramatics in the period from 1800 to 1861

continued in the directions which had been indicated in the earlier years. Although the number of colleges increased greatly during this period, there seems to have been no proportional increase in college play production. Plays continued to be presented at commencements and other college celebrations, and sometimes these plays were written by members of the faculties.

College dramatic activity increased greatly in the period following the Civil War, along with the general awakening of interest in all kinds of extracurricular activity. The college dramatic club, often short-lived but soon replaced, became a commonplace during this period. Musical comedy clubs, highly popular with the students, were beginning at the same time.

Colleges and universities began official and highly publicized interest in the drama with the production of Greek and Latin plays, following the first and most successful of such performances, Harvard's *Oedipus Rex* in 1881. Departments of modern languages followed suit, and French, German, and Spanish plays began to be performed on many campuses toward the end of the century. English departments, encouraged by these successes, also began to experiment with dramatic production.

The development of modern English departments is roughly paralleled by the development of methods of teaching Shakespeare. Beginning as a part of the study of "Rhetoric and Belles Lettres," Shakespeare was next studied linguistically and philologically; subsequent to this approach, the plays were studied as literature; interest in them as dramatic literature, or "theatre pieces," came still later. The entrance of men with professional theatre experience into college teaching hastened this last step; students began



to be told that production in a theatre was a necessary consideration in judging the merit of dramatic literature. Other faculty members, usually amateurs, were encouraging and directing students who were seriously interested in the theatre. Thus when George Pierce Baker, offering the first class in playwriting at Harvard in 1905, ushered in the modern era of American academic theatre, his task was made easier because of the effort made previously by him and other professors to gain recognition in the colleges of the cultural importance of the theatre.

222 pages. \$2.78. Mic 56-287

**AN EXPLORATORY INVESTIGATION OF THE EFFECTS OF THE CHEST-ABDOMEN RESPIRATOR ON THE BREATHING AND SPEECH COORDINATIONS AND THE JUDGED SPEECH INTELLIGIBILITY OF CHILDREN WITH CEREBRAL PALSY WHO DISPLAY ABNORMAL BREATHING PATTERNS AND SPEECH DIFFICULTIES**

(Publication No. 15,049)

Richard Floyd Dixon, Ph.D.  
Syracuse University, 1956

This exploratory study is designed to investigate the effects of a period of training in a chest-abdomen respirator on the breathing and speech coordinations and the speech intelligibility in a group of fifteen children with cerebral palsy who display breathing and speech anomalies.

The hypotheses examined were: (1) silent breathing should display improved coordinations after the respirator training period, and (2) speech behavior should show improvement in the direction of decreased speaking time and number of phrases in speaking prescribed materials, increased intelligibility and greater rhythmicity.

A custom-built kymograph was utilized to secure tracings of the movements of the body wall at the lower sternum and mesogastric areas during silence and speech. Syllable pulses were also recorded during speech. Each speaker spoke the same three-, five-, and seven-syllable sentences and fifty-syllable paragraph.

Measurements of silent breathing included cycles per minute, number of reversals per minute, and chest and abdominal amplitudes. The speech tracings were measured for total time in speaking the sentences and paragraph, number of phrases, and chest and abdominal amplitudes. The number of reversals during the paragraph was determined.

Tape recordings were made while each child spoke different sets of twenty-five monosyllabic words, and ten unrelated sentences varying in the number of syllables. The recordings were audited by groups of Speech Pathology and Audiology majors and intelligibility scores were computed. A rhythm analysis of the sentences was performed.

Each child was scheduled for three complete sets of measurements: (1) a first pre-respirator measure three months prior to the respirator training period, (2) a second pre-respirator measure immediately prior to the training period, and (3) a post-respirator measure immediately following the training period. For the training period each child was scheduled for placement in the respirator for one hour per day, five days per week, for a three-month period.

A questionnaire was sent to the parents and speech

therapists of each of the children requesting information concerning changes in the child's behavior associated with the respirator period.

Complete measures were obtained for nine children on the kymograph tracings and for eight children on the intelligibility and rhythm measures. Analysis of the data is performed primarily with those children on which measurements were complete.

**Results**

Analysis of the data indicates the following:

1. Silent breathing shows significantly smaller chest, and combined chest and abdomen excursions after the respirator training period. Decreases in abdominal amplitude and in number of cycles per minute are observed but are not significant.
2. Breathing for speech shows significant decreases after the training period in speaking time for the three-, five-, and seven-syllable sentences. The children use significantly fewer phrases to speak the fifty-syllable paragraph, and the three-, and seven-syllable sentences. They require less speaking time for the fifty-syllable paragraph, and speak the five-syllable sentence in fewer number of phrases, but these differences are not significant. The reduction in number of reversals does not show significance.
3. Speech intelligibility, as measured by the monosyllabic word lists, shows a significant gain after the respirator training period. Sentence intelligibility and rhythm, although suggesting improvement, do not show significant changes.
4. According to the questionnaire, the parents and speech therapists observed improvements in the behavior of many of the children during the respirator training period. Most favored extension of the training.

The results of this study indicate that the period of respirator training may be associated with improvements in breathing and speech behavior in this group of children with cerebral palsy but, because of the few children studied, the conclusions are to be regarded as tentative.

195 pages. \$2.44. Mic 56-288

**THE EFFECT OF CERTAIN HOME INFLUENCES ON THE PROGRESS OF CHILDREN IN A SPEECH THERAPY PROGRAM**

(Publication No. 15,365)

James Hamilton Egbert, Ph.D.  
Stanford University, 1955

The purpose of this study was to determine if factors within the home affected the progress of children receiving therapy for functional articulatory problems in a public school system.

Two groups of children, ranging in age from six to nine, were selected and paired by speech therapists from the Seattle School System, and the pairing was checked and the children were examined by the writer. The two groups differed in that group A consisted of children who had made above-average or superior progress in



in articulation therapy, and group B consisted of children who had made below-average progress. The two groups of children were comparable in relation to certain factors that may affect progress in speech therapy. The matching of pairs as to sex, school placement, and therapist was exact, and the pairing was close as possible in relation to age, school achievement, and number and severity of sounds which were faulty prior to speech therapy. The groups were comparable in intelligence. Subjects were excluded who revealed: organic causes for the speech disorder, severe illnesses during the speech therapy, hearing losses, or bilingual background. The major unknown factor in both groups was the effect of environmental influences in the home on the children's progress in the speech therapy program.

Through the use of a questionnaire administered by the writer in interviews with the mothers, information was obtained in two major areas. First, did these factors in the home not directly related to the speech program affect the progress of the children: speech models, parental educational and occupational background, number and relationship of siblings, upsets within the home, and domination by the parents? Second, did the parental contributions to the speech program as reflected by their opinions or actions in such areas as the following affect the children's progress: concern over the speech problems prior to therapy; opinions of speech programs prior to therapy; observations, consultations, or reading during the speech program; information received from the speech therapist; home participation in the speech program; effectiveness of home participation methods; and present evaluation of the speech program?

The results of the study indicated that significantly more mothers of the children having made above-average or superior progress in articulation therapy had: (1) received meaningful and clear information from speech therapists concerning the children's speech problems and possible effects of these problems; (2) utilized techniques in home speech lessons that are considered by authorities in the field of speech correction to be desirable; (3) used methods of motivating their children to correct faulty speech patterns that are considered to be desirable; (4) indicated they submitted case history information to the speech therapists; and (5) encouraged their children to talk over the speech problems with them and to try to work out solutions. Significantly more mothers of the children having made below-average progress in articulation therapy indicated that they had: (1) used methods considered by authorities to be undesirable in an attempt to motivate their children to correct faulty speech patterns; and (2) tended to dominate their children through administering frequent and injudicious punishment, maintaining overly high or unrealistic standards, and maintaining an atmosphere of over-protection or over-supervision.

234 pages. \$2.93. Mic 56-289

# A COMPARISON AND ANALYSIS OF THE FACTORS OF RHETORICAL INVENTION IN SELECTED WARTIME SPEECHES OF FRANKLIN DELANO ROOSEVELT AND WINSTON SPENCER CHURCHILL

(Publication No. 15,129)

Austin J. Freeley, Ph.D.  
Northwestern University, 1955

The purposes of this study are: (1) to discover what factors of rhetorical invention Roosevelt and Churchill used on comparable speech occasions before comparable audiences during the Second World War in their efforts to influence public opinion in relation to war aims, and (2) to make certain comparisons of their development of the factors of rhetorical invention in these speeches.

The speeches considered in this study meet the following criteria: (1) speeches delivered by Roosevelt and Churchill when they were the chief executives of their nations during the Second World War, (2) speeches which were judged at the time of delivery to be of sufficient importance to have been given world wide dissemination, (3) speeches dealing with the same or comparable problems of the war and delivered on occasions which, even after the war, are considered to have been critical in the total war effort, and (4) speeches which were delivered to the same or comparable audiences.

In order to facilitate the purposes of the study, a biography of Churchill, a biography of Roosevelt, and a chronology of the Second World War are included. The final chapter presents a critical analysis and comparison of four selected pairs of speeches.

The first pair of speeches were on America's entry into the war. In the handling of ethical proof, Churchill developed factors which would be of particular value in establishing his ethos for his immediate and American audiences; Roosevelt, while not neglecting these audiences, gave additional consideration to the world audience. Both speakers drew on a wide range of factors in developing emotional proof.

The second pair of speeches were delivered in times of adversity; Churchill's speech of June 4, 1940 and Roosevelt's speech of February 23, 1942 marking the low points in the British and American war efforts, respectively. Roosevelt's address on this occasion is unique as it made greater use of visual aids than any previous Presidential speech. In the treatment of ethical proof, Churchill developed the rhetorical factor of friendship "in depth" while Roosevelt developed this factor "in breadth." In the treatment of emotional proof, Churchill devoted more attention to the factors which tend to produce hatred than did Roosevelt.

The third pair of speeches were delivered on the occasion of the Allied invasion of France. Roosevelt's speech was unusual inasmuch as he presented it in the form of a prayer. In the development of ethical proof, Churchill sought to establish his ethos by asserting that he had first-hand knowledge of events; Roosevelt chose to associate himself with "us at home." In the development of emotional proof, both speakers drew on factors tending to produce confidence. Both speakers limited themselves to brief statements and dealt with essentially noncontroversial subject matter.

The fourth pair of speeches were on the Yalta



Conference. In the development of logical proof Churchill tended to support his arguments with a substantial amount of evidence and reasoning, while Roosevelt tended to support many of his arguments by assertions which depended upon audience acceptance of his *ethos* for their validity. Both speakers used similar factors in developing ethical proof, although Churchill made the greater effort to associate himself with international political figures. In developing emotional proof, both speakers gave only passing attention to factors tending to produce hatred, but devoted considerable attention to factors tending to produce confidence.

In the speeches analyzed in this study, both speakers made extensive use of deductive argument in the development of logical proofs. 495 pages. \$6.19. Mic 56-290

THE LONGLEYS OF CINCINNATI,  
MID-NINETEENTH CENTURY  
PHONETIC PRINTERS AND PUBLISHERS

(Publication No. 14,067)

Albert Donald George, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor C. M. Wise

This study presents a descriptive account of the development of a system of phonetic printing known as phonotypy, and the application of this system by a firm headed by Elias Longley in Cincinnati, Ohio. In point of time, the study embraces the interval from 1842, when the idea of phonetic printing was first mentioned by Isaac Pitman, to 1861, when the Longley firm of phonetic publishers was dissolved. This period falls into two distinct parts: first, the development of the original phonotypic alphabet through its various experimental stages from 1842 to 1847; second, the application and development of the phonotypic alphabet in the United States under the leadership of Elias Longley from 1848 to 1861.

The divisions of the dissertation are topical, and consist of the following: (1) The background leading up to the development of the mid-nineteenth century thinking on phonetics, with particular attention to Isaac Pitman; (2) the development of the first practical phonetic printing alphabet by Pitman and A. J. Ellis during the years 1842 to 1847; (3) the revision of the Pitman-Ellis alphabet by the American Phonetic Council in the years 1852 and 1853; (4) the phonetic publishing business of the Longley firm, first with the original alphabet of 1847 and later with the revised American alphabet of 1853; (5) the application made of phonotypy to the educational process of teaching reading, spelling, and diction; and (6) the reflections of the phonetic reform in the general press of the period.

The nature of the study has necessitated leaning rather heavily on two major sources of information. The principal source for the early development of the alphabet was Pitman's *Journal* (title varies) for the years 1842-1848. The source for the activities of the Longleys, and for the development and spread of phonotypy in the United States, was Longley's periodical, which appeared with a variety of titles but is generally indexed as *Type of the Times*, Volumes I through XII (1848-1859), and *Longley's Journal of Progress* Volumes I and II, (Jan. 1860-Aug. 1861).

Several additional research projects may suggest themselves through the perusal of this study, and the periodicals mentioned above are fruitful source material for several more studies of varied nature. Some of them have been suggested in this account. 330 pages. \$4.13. Mic 56-291

ORATIONS ON THE ANNIVERSARY OF  
AMERICAN INDEPENDENCE, 1777-1876

(Publication No. 15,145)

Howard Hastings Martin, Ph.D.  
Northwestern University, 1955

Since the Fourth of July was the most distinctive American national ceremonial of the eighteenth and nineteenth centuries, it was presumed that an investigation of the celebrations of that anniversary by the public delivery of an oration would offer clues to prevailing sentiments, attitudes, and values in American group life, and would reveal the archetype of a kind of address more avidly cultivated in America than elsewhere. The period from 1777 to 1876 was studied because these years included the evolution and decline of this form of ceremonial as a national institution.

Newspapers in major population centers in each geographical region, diaries and journals, travel accounts, periodicals, state and regional historical publications, and several large collections of published Fourth of July orations, as well as numerous secondary accounts, were used to detail the history of celebrations that featured an oration and to assess reaction to the speeches as pieces of the national literature. About one-third of the nearly 2,400 extant orations were studied to discover themes, overall intent, and distinguishing rhetorical features.

The findings of the study were:

(1) Public orations were heard in every year from 1777 through 1876. In 1783, Boston's resolution to hear "constantly" such an address impelled other town councils, patriotic societies, political groups, reformers, and others to plan such ceremonies, which became common by 1800. An elaborate, quasi-religious, rather rigid ritual became traditional by 1825. This form of observance began to decline after the decade of the 1830's, but revived briefly for the centennial in 1876.

(2) Themes of orations reflect the change in national values between 1777 and 1876. Before 1789, themes reflect the values of a nation not yet possessed of a substantial tradition. Such things as America's geography, heroes, history, and the presumed influence of Providence in America's past were among other early themes. After 1789, the new government intensified the consciousness of nationality. The Constitution and the Union, civil liberties, American arts and sciences, rising manufactures, and internal improvements were among other later themes. Many of the themes of these addresses were comprehended in the belief in progress—a belief expressed and implied in many later orations.

(3) Although much Fourth of July oratory was panegyric, many orators chose to instruct and persuade their listeners, to criticize American manners and institutions, to defend the nation's integrity, or to interpret the Declaration of Independence.

(4) A significant part of the national literature, these speeches were often published, widely read and discussed,



and were a determinant of public taste. The oration was a commemorative address — a type of speech widely domesticated in America. A variety of factors produced what came to be recognized as the usual characteristics of the Fourth of July oration. Although critics deplored the excesses of this type of address, a substantial number of orations were serious intellectual pieces worthy of examination today.

(5) The celebration of the Fourth of July with a public oration declined slightly after 1830 and sharply after 1865. Fewer speeches were planned, fewer were published, the oration and ceremonies were satirized and maligned, amusements replaced the once-solemn exercises. Probably the observance declined because the events commemorated were receding into the past, because the recreation supplied by this form of celebration was being supplanted, and because the psychological utility of the ceremony was less strongly felt by mid-nineteenth century Americans.

417 pages. \$5.21. Mic 56-292

#### SOME RHETORICAL ASPECTS OF THE MCGUFFEY READERS

(Publication No. 14,489)

John Thomas Rickey, Ph.D.  
The Ohio State University, 1955

We know that the McGuffey Readers have some historical, literary, and educational significance. Do they have any rhetorical significance? Did the author deal with delivery, memory, style, or any of the other canons of rhetoric? Can his own invention, arrangement, style, delivery, or memory be analyzed? What were the premises of his thinking? Did he analyze his audience? What effect did the audience, toward which his product was directed, have on the success or failure of the Readers? What was the effect of his product on the hearers or readers?

These unanswered questions reveal a rhetorical problem concerning the McGuffey Readers. In an attempt to answer these questions, the problem under consideration has been organized in three parts. They are (1) the influences of the authors and editors on the composition of the Readers; (2) the selection and arrangement of the contents of the Readers; and (3) the audience at which the Readers were aimed and their effect on that audience.

In determining the influences of the authors and editors on the composition of the Readers, we have given especial attention to the early experiences of William Holmes McGuffey and Alexander Hamilton McGuffey, in so far as these experiences have contributed to shaping the preparation of these men for composing the Readers. We have studied the contributions of childhood experiences, educational experiences, professional experiences, intellectual habits, and religious experiences in this connection.

The influence on the Readers of Winthrop B. Smith, the early publisher, and of the editors who supervised the many revisions of the Readers, was considered, in addition to the influence of the McGuffeys.

We find that at least four rhetorical influences affected the selection of materials and instructional methods of the McGuffey Readers. These included:

1. The contemporary educational influence of the passing

of the old type of education and the coming of the new educational system

2. The influence of elocutionary learning
3. The influence of classical rhetoric
4. The influence of Pestalozzi's theories of education

After studying the influences of the authors and editors on the composition of the Readers and the selection and arrangement of the contents, we studied the audience at which the Readers were aimed and the effect of the Readers on that audience. There were three groups of people who used the Readers. They were the pupils, the parents, and the teachers. We have tried to ascertain the aims of this audience and have found that it sought information, advice, and entertainment in varying degrees. Since we felt that the major conditions which absorbed the interest and attention of the audience would have important influences on that audience, and on any rhetorical product addressed to that audience, we included a brief analysis of these conditions.

Among our conclusions, we find that many aspects of the McGuffey Readers should be of interest to the rhetorician as well as to the person in the field of speech education. The importance of such men as William Holmes McGuffey in the integration of rhetorical theory and practice throughout our history has not been thoroughly investigated and evaluated in the past. Among others who deserve such attention are Noah Webster, Lindley Murray, and Caleb Bingham.

160 pages. \$2.00. Mic 56-293

#### A STUDY OF THE MANAGEMENT OF CHARLES KEAN AT THE PRINCESS'S THEATRE: 1850-1859

(Publication No. 14,501)

Budge Threlkeld, Ph.D.  
The Ohio State University, 1955

Only recently has the period of the early and mid-nineteenth century which marked the transition from the Restoration theatre to the modern theatre been brought into proper perspective. The problem involved in the study was to show that the management of Charles Kean at the Royal Princess's Theatre: 1850-1859, was important in relation to the development of modern concepts of stage practice. These concepts are defined as the directorial approach to play production and the use of scenery in terms of environment for the play. Kean's contribution in this regard has been overlooked or overshadowed by the emphasis placed by theatre scholars on the productions of the Saxe-Meiningen company.

The complete theatrical calendar of the Princess's Theatre for the period 1850-1859 was compiled from the daily issues of The London Times. The theater annals were then examined to determine Kean's method of programming his plays in order to achieve a long-run system. Notices and reviews of Kean's productions were studied for references to scenery and production. The most valuable materials were the promptbooks of some of Kean's productions, microfilm copies of which are housed in the Ohio State University Theatre Collection. These promptbooks were analyzed with particular regard to evidences of direction and the use of scenery as environment for the play.

The study revealed that Kean regularly employed techniques of direction and staging which have been credited to



those who came after him. It was found that Kean used box sets for some of his interior scenes as well as conventional wing and border sets. Promptbooks clearly illustrated that Kean integrated all phases of production and achieved a synthesis of production unknown before his time. The promptbooks also determined that Kean utilized practicables and levels. He broke up the areas of action and created new

entrances and exits for familiar plays. His work in this regard was considered by his contemporaries to be entirely new.

Kean's contribution to the theatre was found to be much more important in relation to modern concepts of play production than has heretofore been supposed.

315 pages. \$3.94. Mic 56-294

## ZOOLOGY

**PATHOLOGICAL EFFECTS OF COCCIDIOSIS  
CAUSED BY THE PROTOZOAN PARASITE  
EIMERIA TENELLA IN CHICKENS**

(Publication No. 14,681)

Eldridge Melvin Bertke, Ph.D.  
The University of Wisconsin, 1955

Supervisor: Professor C. A. Herrick

During the course of an infection with Eimeria tenella, the caeca had undergone ulceration and bleeding during the acute stage.

Changes in the liver and kidneys were observed as early as twenty-four hours following artificial infection. The early stages consisted of mild cloudy swelling of the liver cords and the proximal convoluted tubules in the kidney. As the infection progressed to the fifth day, diffuse necrosis of the liver was noted as well as severe cloudy swelling. The kidney at that time had undergone a moderate to severe tubular nephrosis. Some small hemorrhages occurred within twenty-four hours following infection, it was not until the third day that it became a constant entity and continued until the twentieth day. Glomeruli were undergoing change by the seventh day following infection and by the twentieth day they were three to four times normal size due to a thickening of the basement membrane.

Changes in the adrenal glands were evident by the fifth day; lipid granules from the cortex and chromaffin granules from the medulla were greatly reduced in number. This reduction in the number of adrenal granules was followed by an increase in both number and size of granules as well as by an increase in weight of the organs. The adrenal appeared normal by the twentieth day.

Changes in the amount of uric acid excreted by the kidney which were associated with the pathological changes was a decrease during the first three days, and an increase to nearly 80 percent normal by the fifth day. With the advent of heavy caecal bleeding on the fifth day, the efficiency of the kidney to remove uric acid began to decrease, and continued until the tenth day. During the following ten days, the ability of the kidney to excrete uric acid steadily increased until a plateau was reached. The percent removed was considerably below the non-infected chickens.

Liver function rose above normal for the first three days, but with the beginning of caecal hemorrhage, the icterus index fell continually until caecal bleeding ceased at the end of the sixth day. This was followed by a rise in the icterus index until it became normal on the ninth day.

Most of the pathological and physiological changes were

no longer apparent after the twentieth day. The glomeruli were, however, still greatly enlarged by the ninetieth day following infection when the experiments were terminated.  
68 pages. \$1.00. Mic 56-295

**RELATIONSHIPS BETWEEN ENVIRONMENTAL STRESS  
AS REPRESENTED BY FREEZING TEMPERATURES  
AND LACK OF NESTING MATERIAL AND  
REPRODUCTIVE ACTIVITY AND VIABILITY  
IN PEROMYSCUS MANICULATUS**

(Publication No. 15,088)

Paul S. Eskridge, Ph.D.  
University of Pittsburgh, 1955

The following experiments were undertaken in an effort to determine whether or not the protection afforded by nesting material and huddling would so mitigate the effect of continued cold exposure to a group of adult, nonfecund, male Peromyscus maniculatus that they would respond to increasing light periods by showing an increase in testicle size. The protected group was compared to another group exposed to the same cold and light periods but prevented from huddling by being confined in individual cages and not supplied with nesting material. The gain in testicle weight in these two groups was compared with two room-temperature control groups: one exposed to increasing light periods and another kept in continual dark. A final control group was supplied with nesting material and kept in the cold but in continual dark.

The mice were collected in the summer and kept in outdoor pens until December at which time none of them had descended testicles. Unilateral castration was then performed on 50 of the mice and they were assigned to the five groups treated as described above. The removed left testicle was weighed, and the weights for the five groups averaged and subjected to an analysis of variance. This showed no significant differences existing between the five group means.

Treatment continued over a six-weeks period and then the mice were sacrificed and the remaining testicle removed and weighed. This final testicle weight was regressed on the original weight of the left testicle, and the final mean testicle weight for the five groups was examined by covariance analysis. This showed that the increase in testicle size for the two groups exposed to increasing light periods



in single cages with nesting material to be significantly larger than the increase in testicle size for the group exposed to increasing light periods but confined in the refrigerator in individual cages with no nesting material. This shows that, if the mice can react to low temperatures by huddling in groups and constructing a nest of insulating materials, continual exposure to freezing temperatures will not prevent an increase in testicle size. If, on the other hand, they are exposed in individual cages with no nesting material there is little increase in testicle size.

The severe metabolic requirements imposed upon the cold-exposed individually caged mice is indicated by the fact that their food consumption was more than double that of any other group, yet they lost an average of 2.74 grams of body weight during the course of the experiment.

In an additional experiment on diet it was found that a diet rich in fat is necessary if these mice are to survive prolonged exposure to freezing temperatures confined in individual cages without nesting material.

41 pages. \$1.00. Mic 56-296

#### TAXONOMIC AND ADAPTIVE FEATURES OF THE JUVENAL PLUMAGE IN NORTH AMERICAN SPARROWS

(Publication No. 15,452)

Richard Rex Graber, Ph.D.  
The University of Oklahoma, 1955

Characters of the juvenal plumage have received little emphasis in taxonomy. In order to ascertain how characters of the juvenal plumage fitted an accepted classification of one great group of birds, museum specimens showing the juvenal plumage of most North American (north of Mexico) vireos (Vireonidae), warblers (Parulidae), orioles (Icteridae), and tanagers (Thraupidae), as well as of nearly all species of sparrows (Ploceidae and Fringillidae) were assembled and studied. Special emphasis was placed on the sparrows.

The juvenal plumage provides the passerine bird with its first complete insulating covering and its first flight feathers. In most of the species studied it is, however, a flimsy and defective plumage which is quickly replaced by a more durable feather covering. A nestling's inability to produce a more durable plumage is attributable, at least in part, to hormonal imbalance.

There is variation in duration of juvenal plumage in different species, but the period of wear tends to be constant within the species. In the few species which have a durable juvenal plumage, it is long-lived. A durable juvenal plumage is an advanced character. Most species have a fragile juvenal plumage, and long life of such a plumage is probably a primitive condition. There is positive correlation between migratory habits and short-life of juvenal plumage. Juvenal flight feathers develop largely in post-nestling life. In many species these feathers have firm adult-like texture and are not molted with the body plumage but retained for a year. Some species have fragile juvenal flight feathers which are molted with the body plumage. A complete postjuvinal molt is a primitive condition.

Bright colors are not usually exhibited in juvenal plumage. Colors of most frequent occurrence in juvenal plumage

of sparrows are buff, brown, gray, black, and white. Characteristic colors of eye and foot in the adult are lacking in the juvenal and this is considered further evidence of the limited physiology of the nestling. Juvenal plumage patterns are often strikingly different from those in the adult. The most common exclusively juvenal markings are ventral and dorsal scaled pattern. Species pattern-characters of the adult are most often exhibited in the head and back plumage of the juvenal. Juvenal patterns are probably adaptive. A scaled back pattern which occurs only in prairie inhabiting birds, presumably has survival value. In some species this pattern occurs in the juvenal but not in the adult and this is indicative of the greater stresses of juvenal life.

Marked differences in plumage-pattern between juvenals and adults of the same species indicate the possibility of separate genic control. Juvenal life is the weak link in the post-nestling chain of development, mortality of juvenals being far greater than that of older birds. Thus selection for a distinctive juvenal pattern is of greater importance to the species than selection for patterning of any sort in postjuvinal life. Similarity of juvenal and adult plumages does not necessarily indicate primitive condition. It does indicate similarity of selective forces in juvenal and adult life, and what is more, selection for concealing, not for sexual patterns.

In many families of passerine birds there is no special juvenal pattern. In the nine-primaried assemblage of families, juvenal pattern is characteristic of groups which, on the basis of other criteria, may be called advanced; it is not characteristic of more primitive forms.

Juvenal plumage characters have value in taxonomy and should be considered even in broader classification of birds at the level of family and below. Juvenal characters are of great value in defining the limits of monophyletic groups. Relationships in and among genera of North American sparrows are clarified by a careful study of juvenal characters.

295 pages. \$3.69. Mic 56-297

#### STUDIES ON MITES FOUND IN STORED GRAIN IN WESTERN NEW YORK

(Publication No. 15,021)

Gerald William Krantz, Ph.D.  
Cornell University, 1955

The first section of this study deals with the biology and ecology of mites occurring in farm-stored grain from fifteen western New York State counties. In all, twenty-four species of mites were observed in the grain samples collected. Taxonomic keys were devised for each of the three suborders represented, i.e. Sarcoptiformes, Trombidiformes, and Parasitiformes. Eleven of the abovementioned species were of the suborder Sarcoptiformes, eight were classified in the suborder Trombidiformes, and five were found to be members of the suborder Parasitiformes. Of the twenty-four species represented, eight were grain or dockage feeders, thirteen were predaceous or parasitic, and three were mold-feeders. Distribution of each species was determined according to county.

*Cheyletus eruditus* Schrank, a predaceous Trombidiform mite, proved to be the most common species of mite observed in this area. *Tyroglyphus farinae* L., the granary mite, also was found in abundance.



A series of laboratory tests were conducted in order to determine the toxic effect of a number of fumigants and grain protectants on the granary mite, *Tyroglyphus farinae* L. The relative effectiveness of each fumigant was determined by probit analysis of the data, while the grain protectants were evaluated by an analysis of variance.

Chloropicrin proved to be the most effective fumigant when each of the test materials was used alone. Mixture of chloropicrin with carbon tetrachloride gave better results than those obtained when either fumigant was used separately. Other effective fumigants included dichloronitroethane and Dowfume EB-5.

Excellent results were obtained against *T. farinae* with lindane and neotran in the grain protectant test series. Pyrenone 1-10 concentrate and malathion also appeared promising.

It was found that small numbers of alien nonpredaceous mites or insects had little or no effect on populations of *T. farinae* over short periods of time. However, the predaceous mite, *C. eruditus* was found to exert effective, if only temporary, control of *T. farinae* by destroying the adult and active numphal forms of the latter.

175 pages. \$2.19. Mic 56-298

#### RANGING ACTIVITY OF THE NORTHERN WHITE-FOOTED MOUSE, *PEROMYSCUS* *LEUCOPUS NOVEBORACENSIS* FISCHER, IN ITS NATURAL HABITAT

(Publication No. 15,097)

Howard Dennis Orr, Ph.D.  
University of Pittsburgh, 1955

The behavior of *Peromyscus leucopus noveboracensis* was studied from December, 1953, to August, 1954 in its natural habitat. The primary objective was to observe the behavioral responses of this small mammal to various physical and biological factors of its environment. Such information is of ecological importance because it aids in describing the relationships which exist between life and its environment. Another objective was to determine if changes in the amount of activity, the position of activity and the time of activity could be used to express quantitatively the relationships between environmental factors and behavior. A third objective was to add to present information on the daily activity cycle of *Peromyscus* in its natural habitat.

Subjects were tested in an area 30 feet square. Fences served to limit ranging activity to this space as well as to confine movements within to pathways fitted with timed electrical recording devices. The position and time of movements were recorded on kymographs located nearby.

Activity was greatest at about 40 to 50 degrees Fahrenheit, and decreased with changes toward extremes. Barometric pressure had no particular effect. Activity increased when relative humidity increased until saturation was reached; then activity fell off, presumably because of the precipitation. None of these climatic factors affected changes in the position of time of activity.

The number of individuals within the area had no effect on the amount of activity per individual. Averages were almost the same for tests made with one subject as with

six. It was possible that the superabundance of food supplied masked the usual increase in activity due to increased competition when population density increases. However, it seemed more probable that a change in the type of social behavior occurred instead of intensification. Increases in density did alter the position of individuals, causing more of the available space to be used.

Subjects confined to small, screen cages were detected by subjects allowed to move freely. When introduced into an acclimated group of subjects, caged subjects increased activity and caused positional changes. From this it seemed apparent that individuals in natural populations of *Peromyscus* are aware of each other without actual encountering experience. Areas containing caged animals were interacted with in the same way as areas containing freely ranging ones.

Shelter was the most important factor in maintaining positional stability of individual subjects. Moving such shelter always caused moving of subjects, as well as increased amount of activity per individual.

The recording of all movements made over 24-hour periods show this mammal to be basically nocturnal. Only once did any subject move during daylight. Activity began at dusk, increased to a peak shortly before midnight, and then fell gradually until dawn. None of the factors measured altered this pattern. The length of the period of activity depended on the seasonal changes in number of hours of darkness. Peaks were slightly lower with each successive day of testing a given subject.

The results show that variations in amount and position of activity of *Peromyscus* do occur in response to changes in certain physical and biological factors of the environment. It is felt that such activity changes can be used to expand present knowledge of ecological relationships.

96 pages. \$1.20. Mic 56-299

#### THE EFFECT OF TESTOSTERONE PROPIONATE ON GLYCOGEN, TOTAL NITROGEN AND NON-PROTEIN NITROGEN LEVELS IN SKELETAL MUSCLES OF ALLOXAN DIABETIC RATS

(Publication No. 15,426)

Harry Link Saunders Jr., Ph.D.  
Cornell University, 1955

Studies were made on the changes in glycogen, total nitrogen and non-protein nitrogen concentrations in the rectus femoris, diaphragm and levator ani muscles of the rat. Normal, castrated, castrated rats treated with testosterone, intact diabetic, castrated diabetic and castrated diabetic rats treated with testosterone were employed.

It has been shown that the diabetic condition, when induced in the intact animal, does not affect the glycogen levels of the rectus femoris or diaphragm. However, the glycogen content of the levator ani is significantly decreased.

The imposition of diabetes upon castration results in an increase in the glycogen levels of the rectus femoris and diaphragm when compared to the levels seen in the plain castrates. The glycogen level of the levator ani is not influenced by this treatment.

The administration of testosterone to the castrated



diabetic rat does not influence the glycogen levels of the rectus femoris or diaphragm. The glycogen concentration in the levator ani, however, is significantly increased to a level greater than that exhibited in the other muscles of any experimental group.

Castration of the rat results in a decrease in the non-protein nitrogen concentration of all three muscles. The significance varies depending on whether the results are expressed on a dry or wet weight basis.

The administration of testosterone to the castrated rat results in a significant increase in the non-protein nitrogen concentration of the levator ani when expressed on a dry weight basis. The non-protein nitrogen levels of the rectus femoris and diaphragm are essentially unchanged.

Diabetes in the intact rat results in a significant increase in the non-protein nitrogen concentration in the rectus femoris over the level observed in the plain castrate. When compared to the intact diabetic animal, the non-protein nitrogen levels of all three muscles decrease in the castrated diabetic group.

Testosterone administration to the castrated diabetic rat does not influence the non-protein nitrogen levels of the rectus femoris or diaphragm. There is, however, a significant increase in the non-protein nitrogen concentration of the levator ani.

The total nitrogen levels of the three muscles is not affected by the above experimental conditions except in two instances: (1) there is an increase in the total nitrogen concentration of the diaphragm when an intact rat is made diabetic and the results expressed on a dry weight basis, and (2) there is a decrease in the total nitrogen concentration of the diaphragm when diabetes is imposed upon castration and a comparison made with the intact diabetic or plain castrated rat on a wet weight basis.

The growth response of the levator ani, as measured by relative weight changes, is not influenced by the presence or absence of insulin.

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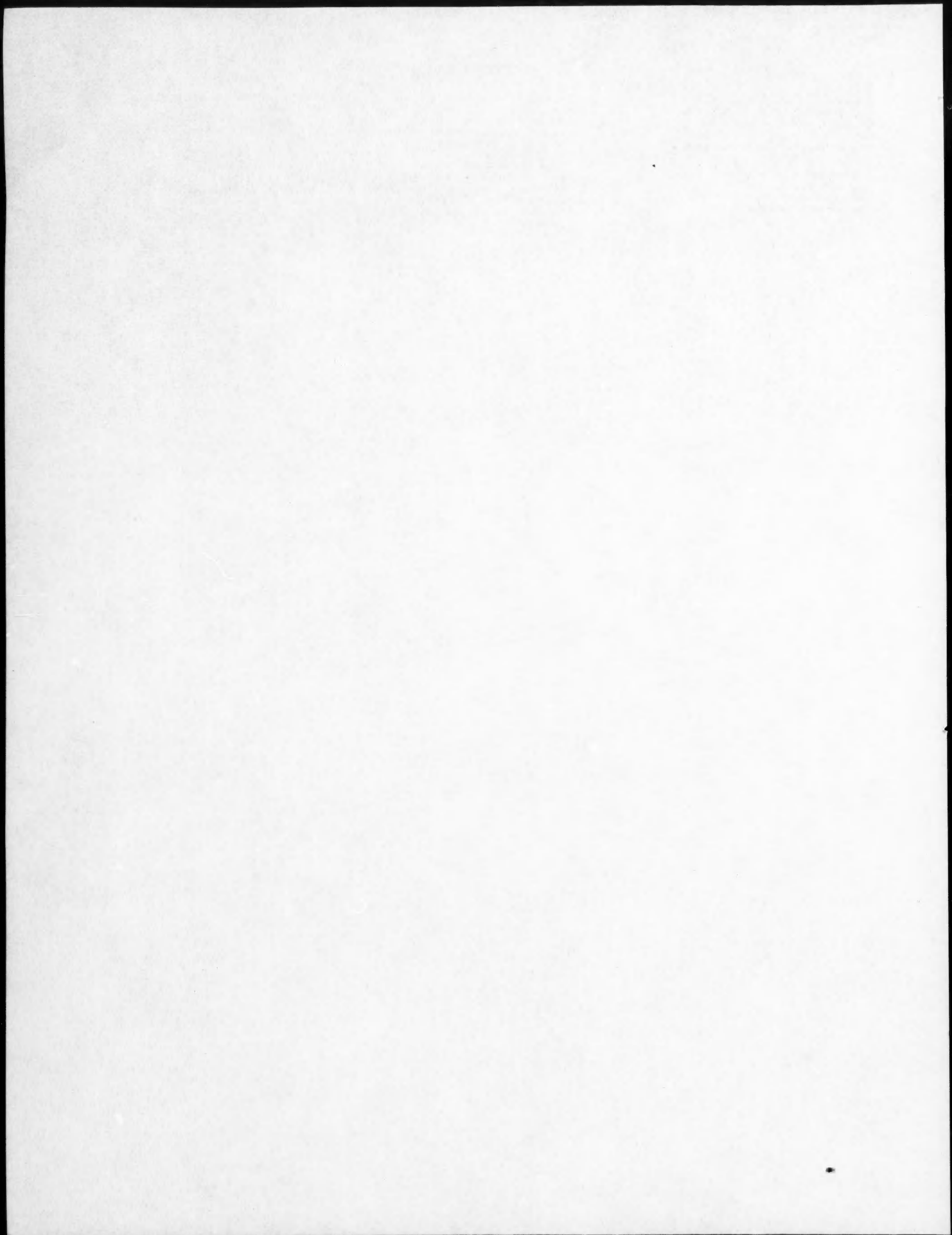
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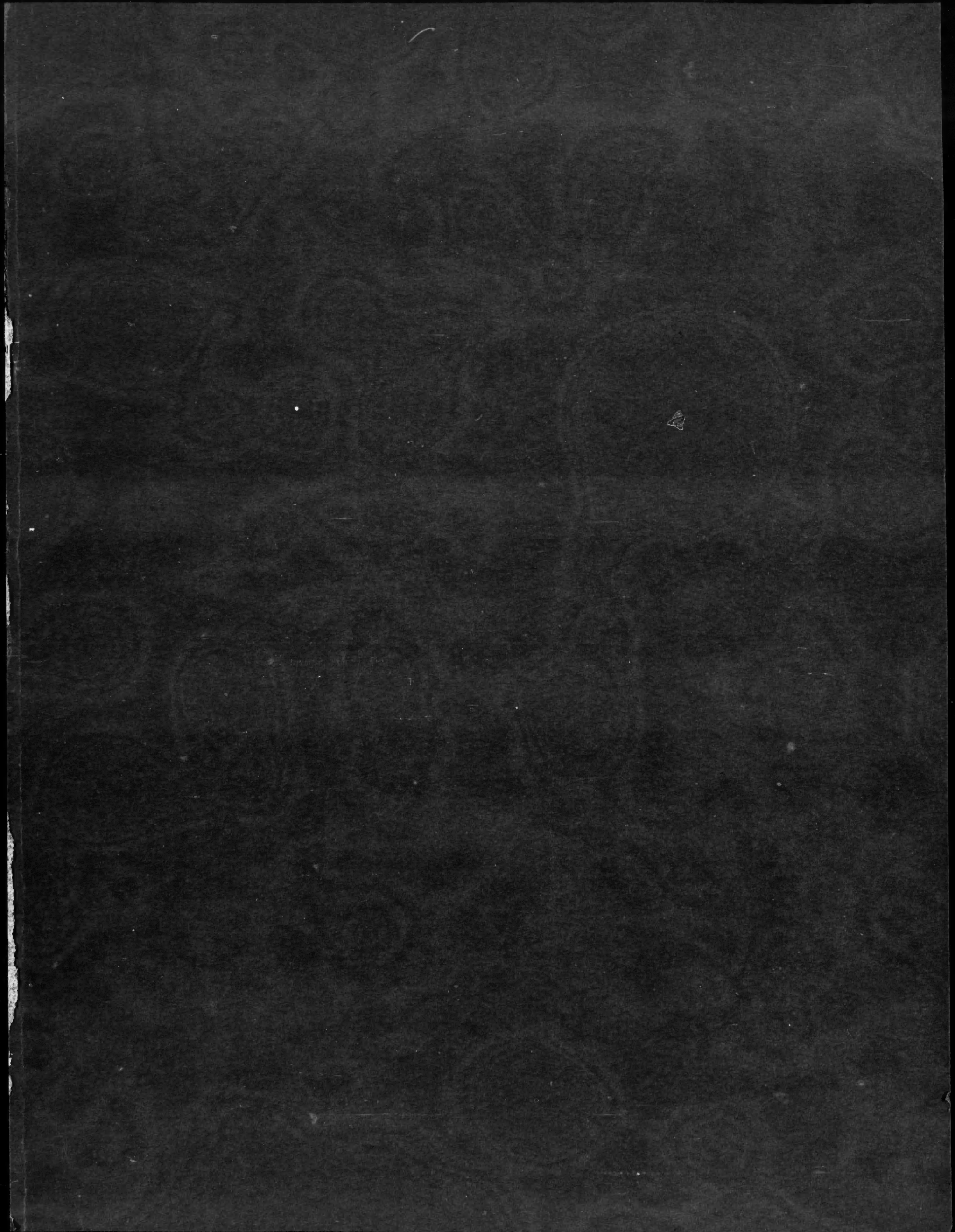
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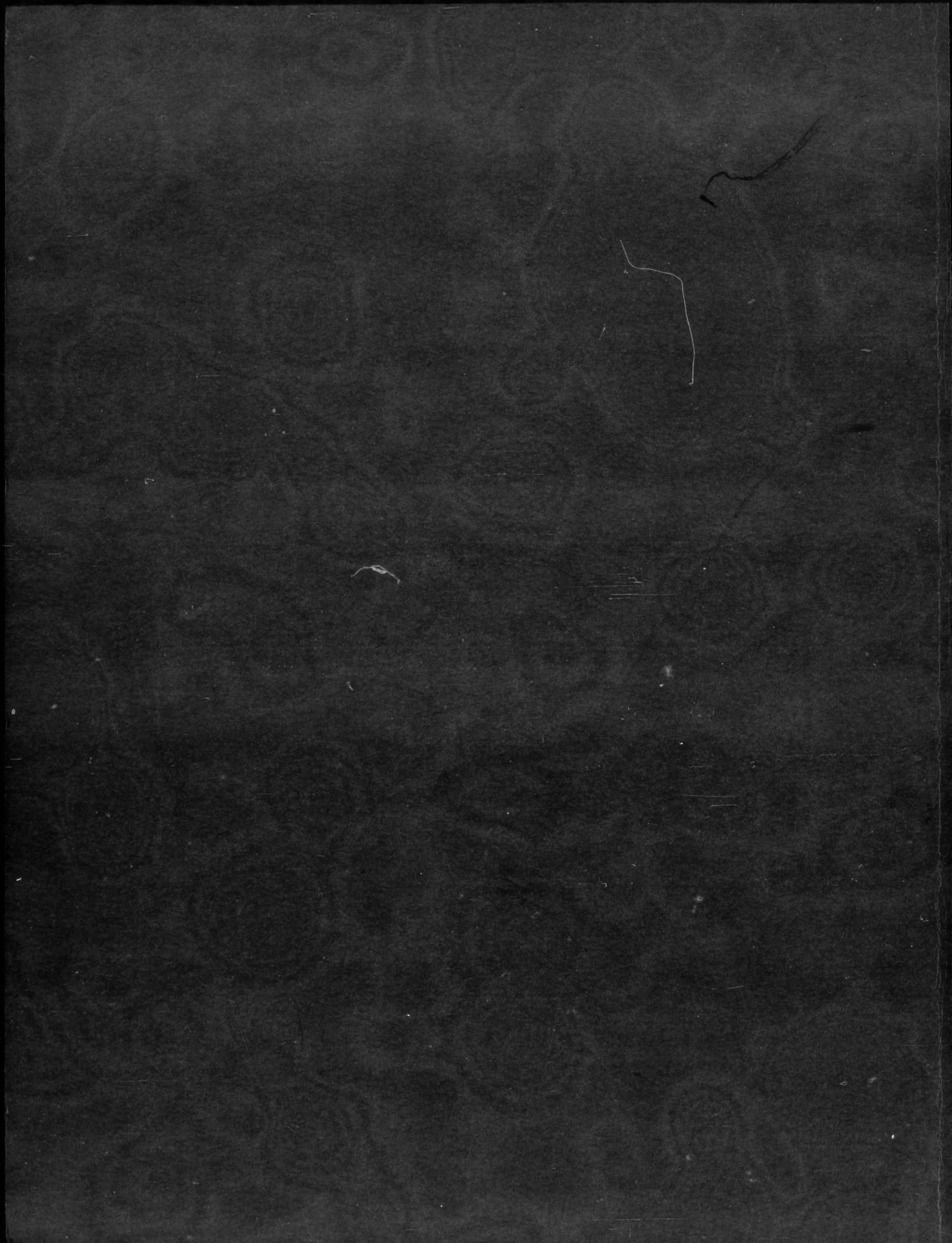
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